ABSTRACT BOOK

National Conference on Forensic Science and Criminalistics (NCFSC 2025)

ADAMAS UNIVERSITY

PURSUE EXCELLENCE

Organised by

Department of Forensic science
School of Basic and Applied Sciences
Adamas University, West Bengal

March 6 -7, 2025

E-mail us: ncfsc@adamasunirersity.ac.in

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Message from the Dean, School of Basic and Applied Sciences

It's our pleasure to invite you in the "**National Conference on Forensic Science and Criminalistics (NCFSC 2025)**", organized by the Department of Forensic Science, School of Basic and Applied Sciences, Adamas University. I take the privilege to thank the speakers, presenters, participants, without whom the success of the conference is not possible. The conference seeks to contribute to presenting novel research results in all aspects of Forensic Science.

The **NCFSC 2025** offers a great opportunity to bring together Academicians, Researchers, Scientists, and Students in a common platform to deliver the latest innovative research result, the most recent development and the trends in Forensic Science and Criminalistics. The conference provides opportunities for the delegates to exchange new ideas face-to-face, to establish research relations as well as to find partners for future collaborations. It offers the premier research forum to present their latest research results, ideas, developments, and applications in all areas of Forensic Science.

I hope that the conference results will lead to significant contributions to the knowledge in the up-to-date scientific fields.

Prof. Bimal Kumar Sarkar
Dean, School of Basic and Applied Sciences
Adamas University

Message from the Organizing Chair, NCFSC 2025

It is the great pleasure that I extend a warm welcome to all of you for the upcoming conference on " National Conference on Forensic Science and Criminalistic" organised by the Dept. of Forensic Science under the Basic and Applied Science, Adamas University scheduled for 6th and 7th of March 2025.

This conference provides a dynamic platform to bring together researchers, scientists ,forensic experts and students from across the country to discuss the latest advancement of forensic science and the critical role of forensic science in the investigation of crime.
I am confident that the involvement of all renowned personnel in this conference will contribute to the continual progress and development of forensic science in our nation and enhance the safety and security of our society.
Thank you for your participation and we look forward to fruitful and inspiring conference.

Warm regards
Dr. Natun Ghatak
Associate Professor
Dept. of Forensic Science
Adamas University.

Message from the Convener

It is with great pleasure that I welcome you all to the **National Conference on Forensic Science and Criminalistics (NCFSC 2025)**. This conference serves as a vital platform for scholars, researchers, and professionals to exchange groundbreaking ideas and advancements in forensic science, enhancing both theoretical and applied aspects of the discipline.

Forensic science plays a pivotal role in the pursuit of justice, and as technology evolves, so must our methodologies and approaches. This conference brings together leading experts, practitioners, and students to engage in insightful discussions, share innovative research, and explore the latest developments in forensic investigations, criminalistics, and related disciplines.

NCFSC 2025 aims to foster interdisciplinary collaboration, encourage young minds, and contribute to the ongoing progress in forensic science. I extend my heartfelt gratitude to all speakers, presenters, and participants for their valuable contributions. I am confident that this event will be a rewarding experience for all, inspiring new ideas and strengthening the forensic science community.

Wishing you all a successful and enriching conference.

Saroj Kumar Amar, PhD
Convener, NCFSC 2025

Message from the Organizing Secretary, NCFSC 2025

Dear Esteemed Delegates, Scholars, and Forensic Science Professionals, It is with great honor and enthusiasm that we present the Abstract Book of the [NCFSC 2025] – National Conference on Forensic Science and Criminalistics.This compilation embodies the intellectual rigor and innovative spirit that define the ever-evolving discipline of forensic science.

The abstracts featured in this volume showcase cutting-edge research, novel methodologies, and transformative advancements across diverse forensic domains, including forensic biology, toxicology, digital forensics, crime scene analysis, and forensic intelligence. These contributions not only reflect the depth of scientific inquiry but also underscore the pivotal role of forensic science in upholding justice, enhancing security, and addressing contemporary challenges.

We extend our deepest appreciation to all researchers, academicians, and professionals whose invaluable contributions have enriched this conference. It is our hope that this Abstract Book serves as a catalyst for meaningful discourse, collaborative endeavors, and future breakthroughs in forensic science.

May this scholarly exchange inspire new perspectives, foster innovation, and contribute to the advancement of forensic research and practice.

With warm regards,

Dr. Biswarup Dey

Organizing Secretary
NCFSC 2025
Adamas University
West Bengal

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Oral Presentations:

NCFSC2025/FRS-001

A Study on the Sexual Dimorphism of The Cheiloscopic Traits in Forensic Application from the Bengali Linguistic Population of West Bengal

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ABSTRACT

The scientific observation of lip linings is termed Cheiloscopy. The lines which are observed on the surface of the labial mucosa are not true lines. Those are formative depressions and are pointed as grooves. The sixfold classification is used globally based on the structural variation of grooves across the lip. Type IA, IB, II, III, IV, and V are well documented and can be used for personal identification in forensics. Like the finger minutiae, the fork or bifurcation is observed in a minute observation of type II patterning in the groove structure. As the fork count in dermal ridges can determine a person's sex-based and individualistic identification, the present attempt will try to determine the potentiality of fork-type grooves and their count to determine personal identification. Further, the human lip has a well-known sexual dimorphic variation. Therefore, the present attempt also did a comparative study on lip length and lip breadth. To solve the purpose, the cheiloscopic prints of 100 adults among 49 males (23.82±8.52) and 51 females (22.25±7.49) were incorporated from the Bengali linguistic population of North 24 Parganas. All the prints were obtained using the lipstick and tape method. The results revealed that the breadth of lips is not significantly ($p<0.05$) different, but the length of the lips is significantly ($p<0.05$) different for males and females. Regarding the number of grooves, the females have a significant ($p<0.05$) higher number than the males. However, in the distribution of fork-type grooves, males make up a significant ($p<0.05$) higher number than females. That sexual dimorphic nature of the fork type groove numbers therefore have a potentiality to act as an obvious tool for individuals sex prediction through the lip impressions.

Keywords: Cheiloscopy, Sexual Dimorphism, Fork-type Groove Patterns.

NCFSC2025/FRS-002

A Study on the Stature Estimation from the Anthropometric Measures of Feet and Footwear among the Youths of North 24 Parganas, West Bengal

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ABSTRACT

The foot impression, bare or shoe, is a common type of evidence that remains on major crime scenes. The present study attempts to estimate the stature from foot anthropometry and footwear morphology. This study examines the differences in a range of anthropometric variables between 50 males and 50 females from the youth population of North 24 Parganas, West Bengal. The weight, stature, shoe size, foot length, foot breadth, step distance and gap between heels were obtained from the studied participants by following the standard methodology and instrumentation. The statistical interpretation and the independent t-test, paired t-test, Mann–Whitney U Test, and linear regression were used to assess statistical differences and relation prediction. The study revealed that sexual dimorphism had an influence on left foot breadth and right foot breadth the most ($p < 0.05$) while weight had the least influence ($p = 0.865$). Female step did not show any positive association, while other parameters such as shoe size, foot length and foot breadth had a significant($p<0.05$) relation for males and females. The present study also attempts to predict the bilateral side-based statute estimation formulise to all the taken variables from the studied population. The significant ($p<0.05$) sexual dimorphism of human feet, footwear and the estimated formulise can add an importance to the techniques in forensic science.

Keywords: Stature Estimation, Sexual Dimorphism, Foot, Footwear, Forensic Science.

NCFSC2025/FRS-003

A Study on the Structural Variation of the Cupid Bow and Lower Cupid Area and Groove Patterns of the Human Lip (Cheiloscopy)

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ABSTRACT

This present study followed the structural variation of the Cupid bow and lower cupid area and groove patterns of the human lip from West Bengal, from Purba Barddhaman, Hooghly and North 24 Pargana districts. The sample was collected from 150 subjects, where 73 were males (24.15±9.71) and 77 females (25.86±10.56). Prints were obtained from the subjects, and the variables were measured using a Quarter Scale. Cupid bow structures were identified. The results were based on the anthropometric measurements from the specific regions of human lips, which primarily help in Suspect identification and personal identification in Forensic fields.

Keywords: Cupid bow, Lower Cupid Area, Anthroposcopy, Forensic Cheiloscopy.

NCFSC2025/FRS-004

A Study on the Estimation of Total Palmar Length from the Digital Phalanx Lengths: A Dermatoglyphic Insight

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ABSTRACT

Biometrics is the scientific technique used to measure and analyze the unique individual characteristics that might be physical and behavioral features of an individual, which have a potential implementation aspect in forensics. The dermatoglyphic imprint is the most usual evidence to remain and is obtained from the crime scene. However, the conclusive prediction of the sex and gender of that dermatoglyphic impression's owner required more complex analysis and software dependencies. The working hand impression can be found on every possible surface encountering an event. The digital phalanx impression can be laid over by

holding an object. Considering this, the present study was designed to predict the total palmar length through the linear distances of the digital phalanx length from a whole palmar dermatoglyphics impression. To solve the purpose, the right palm impression was obtained from 100 (males 50; 20.18±1.38 and 50 females 19.61±1.48) university-level students of North 24 Parganas Districts. All the prints were collected according to the standard ink and roller method. The data interpretation was done by SPSS (version 22), and the probability limits were set on 95% probability limits. The present study revealed that all 2nd and 3rd phalanx of all digits have significant ($p<0.05$) sexual dimorphism. Among the studied males, higher R^2 values were observed in DE (0.401), CD (0.309), and EF (0.341). However, IJ (0.095), CD (0.087), and PQ (0.057) revealed higher R^2 values among the studied females. DE (0.401) is the best predictor of TPL for males, and IJ (0.095) is the best predictor for females.

Keywords: Dermatoglyphics, Hand Geometry, Palmar Length Estimation, Sex Determination.

NCFSC2025/FRS-005

A Study on Decomposition and Bioindication: The Impact of Carbofuran-Infused Fish on Ants

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ABSTRACT

Introduction and Objective: Pesticide pollution is an increasing problem because of its effects on the environment and non-target organisms. This study examines the functional role of ants in the decomposition of fish carcasses infused with carbofuran-based insecticide, a widely used but highly toxic. The primary objective is to evaluate ant behaviour, mortality, and pesticide bioaccumulation to determine their potential as bioindicators of environmental pollution.

Methodology: A controlled experimental setup was established, exposing ants to fish carcasses treated with different concentrations of Carbofuran. Behavioural aspects like foraging, movement and mortality rates were monitored and recorded. Pesticide residue detection in ant specimens using Fourier Transform Infrared (FTIR) Spectroscopy was performed and IBM SPSS statistical software was used to compare significant differences between control groups and treated groups.

Results and discussion: The analysed data, revealed significant differences in mortality rates between the control and treated groups through Independent Samples T-Test ($p < 0.05$). The behaviour score of the control group averaged 1.2 which means that the ants were most active. In contrast, the treated group had a

much higher mean behaviour score of 2.7, reflecting a shift toward lethargy or paralysis. The p-value calculated for this test was also significantly less than 0.05 thus reaffirming that treated ants showed a much more impaired behaviour when compared with the control group. Additionally, repeated measures ANOVA showed that the effects of carbofuran became more pronounced over time, with prolonged exposure leading to greater behavioural disruptions and higher mortality rates. These findings suggest that carbofuran exposure significantly altered ant behaviour such as decreased foraging efficiency, aimless movement, and elevated mortality (dose-dependent) behaviour. FTIR analysis proved the existence of carbofuran residues in the ant samples, thus elucidating bioaccumulation. Statistical analysis in turn confirmed these observations, demonstrating a significant relationship between pesticide exposure and altered ant activity.

Conclusion: These observations have important implications in forensic entomology, forensic toxicology and ecosystem surveillance, highlighting the capacity of ants to acquire environmental toxicants thereby demonstrating the use of ants as sensitive bioindicators of pesticide contamination. Further studies should be aimed at long-term ecological effects, broader ecological associations, and potential applications in the assessment of environmental risks. Integration of ant-based bioindicator models into environmental surveillance programs may result in enhanced pesticide management and ecosystem-conservation measures.

Keywords: Forensic entomology, Pesticide contamination, Bioindicators, Bioaccumulation, Carbofuran toxicity

NCFSC2025/FRS-006

Environmental Crime Investigation and Green Criminology

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ABSTRACT

Environmental crime is any illegal act that harms the environment, wildlife, biodiversity, or natural resources. Examples: illegal logging, illegal fishing, illegal mining, and wildlife poaching. This Crime Investigate forensic experts help investigators reconstruct the timeline of events, estimate the damage, and determine the cause. Investigators use environmental criminology to analyse the environment for factors that may encourage criminal activity. International organizations like Interpol and the United Nations

Environment Programme (UNEP) share information and work together to investigate environmental crimes. This crime impact is climate change, deforestation, and the thinning of the ozone layer. They can also lead to economic losses, loss of livelihood, and human health problems.

Green criminology provides Engagement with environmental crimes and wider environmental harms. Green criminology applies a broad ‘‘green’’ perspective to environmental harms, ecological justice, and the study of environmental laws and criminality, Moving beyond mainstream criminology’s focus on individual offenders, green criminology also explores state failure in environmental protection and corporate offending and environmentally harmful business practices .Green criminology is that of whether environmental harm rather than environmental crime should be its focus, and whether green ‘‘crimes’’ should be seen as the focus of main stream criminal justice and dealt with by core criminal justice agencies such as the police, or whether they should be considered as being beyond the mainstream.

Key Notes: Environmental Crime, Investigation, Green Criminology, Criminal Justice

NCFSC2025/FRS-007

Silent Witness: - The Role of Condom Analysis in Forensics: Their Possibilities, Challenges and Success

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ABSTRACT

DNA profiling plays a crucial role in sexual assault cases, providing valuable evidence for identifying perpetrators and linking them to crimes . While DNA analysis alone cannot prove that a sexual assault occurred, it can confirm the presence of a person's DNA . The probative value of DNA evidence depends on case circumstances; it is especially crucial in stranger assaults and child sexual abuse cases. But what if spermatozoa were not found on a site of crime? What if a barrier was used? What if the perpetrator used condoms while committing the crime? Forensic analysis of condom residues has gained importance in sexual assault cases where DNA evidence may be absent. This trend arises from the common practice among perpetrators to use condoms to avoid leaving behind incriminating biological evidence. Condom use in India has increased from 2.1% in 1992-93 to 5.2% in 2005-06 among males aged 15-54. However, overall usage remains low despite various initiatives . In sexual assault cases, condom use prevalence ranges from 11.7% to 15.6%, with younger suspects and those using weapons more likely to use condoms. The vaginal matrix composition using DRIFTS-FTIR and py-GC/MS to understand the background contribution for forensic analysis of condom evidence. Condom evidences are increasingly detected victims, suspects. Protocols have been developed for the analysis of silicone-based condom lubricants using DRIFTS- FTIR and py-GC/MS, but very little research is concerned with the background contribution of the vaginal matrix itself. Intimate partner violence (IPV) is associated with increased condom use and other modern spacing contraceptives among married women in rural India . Condom-

derived lubricant residues can serve as critical trace evidence in sexual assault cases. When no male DNA is recovered, the presence of these residues can help confirm or refute claims made by victims and suspects alike. Various analytical techniques have been explored for identifying and differentiating condom brands and lubricants. However, challenges remain in reproducibility, sensitivity, and validation of analytical parameters, particularly when considering human matrices. Further research is needed to develop accessible protocols for forensic laboratories and improve the analysis of condom traces in real-world scenarios.

Keywords: Forensic science, sexual assault, condom.

NCFSC2025/FRS-008

Human Trafficking – A Global Crisis Hiding in Plain Sight

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ABSTRACT

Human trafficking is a widespread violation of rights that impacts over a million people every year, mainly women and children. This crime involves tricking, moving, and exploiting individuals using deceit, pressure, or violence. Victims often face forced labor or sexual exploitation, enduring serious physical and emotional harm, health dangers, and lasting trauma. The main reasons for trafficking are closely linked to poverty, lack of job opportunities, and the need for cheap labor and sexual services. Traffickers exploit those who are vulnerable, operating through complicated networks that benefit from corruption and weak legal systems. Even though there are international efforts to fight against trafficking, the industry keeps making billions of dollars every year. To tackle this issue, it's essential to have a solid plan that includes finding victims,0 pursuing legal action against traffickers, and providing strong support for survivors. Helping victims return safely, offering recovery programs, and facilitating long-term reintegration are key to assisting them in rebuilding their lives. Boosting global cooperation, implementing stricter laws, and raising awareness are vital steps in breaking down this hidden crisis. By recognizing the extent of human trafficking and taking firm action, communities can move towards ending this modern form of slavery.

Keywords: Human trafficking, potential victim, causes, statistics.

NCFSC2025/FRS-009

Digital Threats and Cybercrime: Analysing Online Behaviours and Security Awareness in Young Adults

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ABSTRACT

Cybercrime is any illegal activity or activities that utilizes computer, a computer network, or a networked device to perpetrate crime, and also becoming an emerging issue or a rising threat among the youth adults aged between 16-30. The population of this age group makes extensive use of digital mediums and accesses it but is usually deprived of proper cybersecurity knowledge. This research investigates the prevalence of cybercrime victimization in this group, with a focus on gender associated difference, patterns of online behaviour and cybersecurity awareness. Data were gathered using a systematic survey of participants' cyber threat experiences, social media usage and gaming engagement, exposure to phishing, and online safety behaviour.

The findings reveal that more females experiencing cybercrime than males. Both genders frequently received suspicious messages, with slightly higher reports from females. Most respondents (both male and female) rarely share personal information online, while a similar number of respondents rarely share personal information online, a small percentage does so occasionally or frequently, with females showing a slightly higher tendency. Under security habits, 72.22% of females implement two-factor authentication as compared to 67.39% of males. Yet password change is greater in the case of males (41.30%) compared to females (24.07%). Even with regular use of the internet, many respondents are still at risk due to sporadic sharing of information and interaction with potentially malicious links. The research highlights that in order to reduce the risks of cybercrime among young individuals, specific cybersecurity training is required, especially in the areas of password protection, phishing detection, and general digital hygiene.

Keywords: Cybercrime, cyber security awareness, social media risks, digital safety.

NCFSC2025/FRS-010

Crime Scene Complexity: The Need for Interdisciplinary Collaboration in Forensic Anthropology

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ABSTRACT

Forensic anthropology, a vital sub-discipline of biological anthropology, has made significant advancements in aiding medicolegal procedures. However, it faces several challenges that can impede investigations. One major issue is the manipulation of crime scenes based on media portrayals or by someone with greater knowledge of the forensic science, which can mislead investigators. Additionally, the transient nature of fingerprints in warm temperatures, the absence of pathological symptoms or marks on skeletons, and the necessity of identifying suspect ethnicity for narrowing down suspect lists pose significant challenges. Triangulation, a socio-cultural anthropology methodology, enhances the validity of findings by employing multiple techniques, involving more people, and repeating methods. This approach ensures robust and reliable results. Innovations like digital scanning, micromorphological analysis, and forensic podometry have furthered the field by providing more precise and detailed findings. The role of law enforcement becomes crucial, particularly in cases involving tampered or limited evidence. The legal system must adapt to these scientific advancements to ensure justice is served. Addressing gaps in law enforcement procedures and creating robust laws to handle such situations is essential. The article emphasizes the importance of not only developing new forensic techniques but also strengthening existing methodologies. By incorporating techniques from other anthropology disciplines, forensic anthropology can enhance its resilience and reliability. This interdisciplinary approach is key to overcoming current limitations and ensuring the field continues to support accurate medicolegal investigations.

Keywords: Forensic anthropology, interdisciplinary approach, medicolegal procedures, crime scene manipulation.

NCFSC2025/FRS-011

Integrating Digital Audio Workstation in Forensic Voice Authentication: A Comparative Study on Modulated and Original Speech Patterns

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ABSTRACT

The integration of Digital Audio Workstations (DAWs) in forensic authentication offers innovative methods for analysing speech patterns, addressing challenges in the identification and verification of audio evidence. This study examines the comparative efficacy of DAWs in processing modulated and original speech patterns for forensic voice analysis. The primary objective of this study is to evaluate the accuracy, reliability, and practical application of DAW-based analysis techniques in detecting modifications or manipulations in audio recordings. By using advanced tools within DAWs, with enhanced precision in identifying modulations and irregularities, this study explores methods for enhancing and comparing speech signals. The outcome includes the establishment of DAWs as a powerful tool which can be utilised by FSLs, for differentiating between authentic and modulated speech. This research aims to contribute to the growing body of knowledge in forensic audio analysis, offering valuable insights into the application of DAWs for legal and investigative purposes.

Keywords: Voice analysis, Digital Audio Workstation, Speech signals.

NCFSC2025/FRS-012

Artificial Intelligence in Personal Identification: Unlocking Anthropometric Evidence- A Scoping Review

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ABSTRACT

Being evidence-driven field, Forensic science has to deal with lots of data for personal identification and build a connection to the crime; thus, it needs to be assessed very carefully and meticulously. On the other hand, Forensic anthropology, a subfield of anthropology using different anthropometric techniques aids in

personal identification through age estimation, sex determination and so on. However, at a crime scene, a lot of evidence are available and the experts need to extract relevant data, which is a tedious job indeed. Artificial intelligence (AI) becomes relevant in this context as it can extract large sets of data and provide assessment if trained properly. This study tries to find out the relevant articles regarding the applicability of Artificial intelligence (AI) in Forensic investigation for personal identification using anthropometric data from crime scenes. This study has reviewed the articles pertinent to the aim of this study, searched through Google Scholar and PubMed search engines using the keyword combinations like "Artificial Intelligence Forensic Anthropology", "Artificial Intelligence Forensic Dentistry", "Artificial Intelligence age estimation", & "Artificial Intelligence sex determination". Using PRISMA guideline, relevant articles have been extracted and analyzed. It has been found that different subset of AI such as machine learning, deep learning, neural network models have been incorporated for data extraction and analysis of anthropometric evidences pertinent to personal identification in forensic investigation ranging from age estimation, and sex determination to facial recognition. This study highlights the promising future for AI in forensic investigation by designing predictive models through the collaboration of Forensic anthropology, computer science and forensic science.

Keywords: Artificial Intelligence (AI), Forensic Anthropology, Machine Learning, Deep Learning

NCFSC2025/FRS-013

From Evidence to Inference: The Transformative Influence of AI in Crime Scene Reconstruction

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ABSTRACT

Crime scene reconstruction is a crucial aspect of forensic investigations, enabling law enforcement to interpret evidence, establish event sequences, and determine timelines in criminal cases. Conventional reconstruction techniques, which depend on manual documentation and expert judgment, often face challenges such as inefficiency, subjectivity, and potential human error. The incorporation of Artificial Intelligence (AI) in forensic science is transforming this process by significantly improving precision, speed, and reliability. AI-powered technologies, including machine learning, computer vision, 3D modeling, forensic facial reconstruction, are redefining forensic methodologies and enhancing the accuracy of crime scene analysis.

AI-powered 3D modeling and virtual reality (VR) help create highly detailed digital versions of crime scenes, allowing investigators to examine evidence from different angles. These virtual reconstructions are especially useful in court, where they provide jurors and forensic experts with a clear, immersive view of the crime scene. It has also greatly improved forensic facial reconstruction, making it easier to identify unknown victims by recreating their faces from skeletal remains. This has helped solve many cold cases by giving investigators new leads, naming one of the pragmatic examples such as the New Delhi "Blind Case" January 2024.Additionally, AI-driven video and image analysis plays a key role in tracking suspects. By quickly analyzing large amounts of surveillance footage, AI can detect and follow individuals with greater accuracy than manual methods.

Although AI has significantly advanced forensic science, its implementation comes with several challenges. Algorithmic bias, ethical dilemmas, data privacy concerns, and the need for forensic validation are major obstacles that must be tackled. The acceptance of AI-generated evidence in court remains a topic of debate, highlighting the urgent need for standardized guidelines and regulatory frameworks to ensure its reliability and credibility. Additionally, the lack of consistent AI forensic standards across different legal systems creates complications in cross-border investigations and international legal proceedings, raising concerns about its uniform application in global law enforcement.

This paper examines the role of AI in crime scene reconstruction, highlighting its applications, methodologies, and challenges. It also presents real-world case studies demonstrating how AI-driven forensic analysis has played a crucial role in solving crimes. The future of forensic science is increasingly dependent on AI's integration with emerging technologies such as augmented reality, deep learning, and automated forensic simulations.

Keywords: Crime Scene Reconstruction, AI Integration in Forensics, 3D reconstruction, Facial Reconstruction, Deep Learning.

NCFSC2025/FRS-014

An Empirical Research Based Study of Bloodstain Detection on Different Fabrics After Washing with Different Detergents at Variable Interval of Time Through Kastle Meyer Test

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ABSTRACT

The analysis of blood stain has become a pivotal role in forensic investigation, specifically in cases like homicide, suicide, serial killing, along with rap e cases where the culprits aim to hide evidence like blood through washing with different detergents. The ongoing research study explores the efficiency of detection of blood stain on different fabrics after washing with different detergents at a variable interval of time. The present study involves staining cotton, terrycot, silk, along with denim fabrics with human blood, allowing them to dry for twenty-four hours before washing them with different detergents. Further analysis was done after washing with different detergents through the Kastle Meyer test to detect blood. The present study highlights the significance of a quick investigative technique in revealing blood stain on fabrics where attempts were made to destroy blood evidence.

Keywords: Forensic Analysis, Blood stain, Different fabrics, Different detergents, Variable Time, Kastle Meyer Test.

NCFSC2025/FRS-015

Differential Retention of Pollen Grains on Clothing Fabrics by Tape Adhesive Method

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ABSTRACT

The analysis of pollen grains to solve criminal cases became vital through studies of forensic palynology since the mid-20th century. The study examines various factors which affect pollen retention on clothing fabric with the goal to develop improved forensic evidence collection techniques. A comparison was made between the amount of pollen that attaches and retains to fabrics during both light and heavy usage conditions through analysis of pollen and fabric properties. Pollen retention proved sensitive to the pollination type following light wear periods, showing that pollen dispersal methods influence the initial deposition process. Present collection and analysis approaches are costly and time-consuming. Therefore, pollen collection from fabrics is done by using adhesive tape as an alternative method as it is simpler, faster and less expensive than other methods. The analysis highlights the importance of studying how pollen reacts to fabric properties when developing reliable pollen profiles for forensic use to provide trustworthy evidence during criminal investigation processes. The research helps advance forensic science by developing modern streamlined approaches for conducting palynological examinations.

Keywords: Pollen grains, Palynology, Fabrics, Adhesive tape

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Emerging Nanomaterials Used for Latent Fingerprint Development in Forensic Science

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ABSTRACT

Nanotechnology, which involves manipulating matter at the nanoscale, has wide applications across various fields, including forensic science. Integration of nanotechnology-based knowledge and applications into crime-scene investigations has given rise to the emerging field of nano-forensics. One important area of application is the development of latent fingerprints, where conventional methods such as fingerprint powders and chemical techniques often face various challenges. Nanomaterials, born from nanotechnology

offer a promising solution to these limitations due to their unique physical, chemical, and optical properties. Fingerprints are regarded as significant evidence in every crime scene, and nano-based techniques have enormous future promise in fingerprint investigations. Novel materials like gold, silver, zinc oxide, silicon oxide, carbon-based nanostructures, quantum dots, etc. have all demonstrated remarkable success in enhancing fingerprint visibility across different surfaces including porous, non-porous, and irregular textures. These materials can provide higher sensitivity, improved contrast, and greater stability compared to traditional methods. The present manuscript discusses modifications, merits, demerits, and future potential of emerging nanomaterials in fingerprint development. Additionally, nanotechnology's adaptability allows for the integration of detection techniques with advanced imaging and sensing systems, enabling faster, non-destructive fingerprint analysis. Despite all impressive advancements, there remain challenges, like cost and toxicity, advancements in fingerprint development are expected to lead to more precise and reliable crime scene investigations as researchers refined nanotechnology-driven approaches.

Keywords: Nanotechnology1, Forensics2, Latent fingerprints3, Nanomaterials4

NCFSC2025/FRS-017

Emerging dynamics of basic and applied chemistry in forensic Investigation

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ABSTRACT

The study of chemistry provides basic concepts of chemical characteristics, effects, and techniques, but applied chemicals implements these concepts to practical approaches for investigating crime scenes, research and legal proceedings, ensuring accuracy, reliability, and scientific integrity in forensic investigation. The integrating of fundamental and applied chemicals into the criminal justice system has revolutionized study techniques, offering reliable and precise approaches to evidential evaluation. Experts in this area use an array of techniques and tools for determining unidentified substances. A broad range of techniques is required related to the destructive characteristics of certain instruments and the number of unidentified substances that can be detected at the Scene. This study investigates the emerging dynamics of chemistry in criminal investigations, concentrating on developments in scientific methods for chemical residual proof evaluation, including the significance of collaborative approaches. Chemical studies are growing more accurate and reliable due to improvements with spectroscopy, chromatography, and microfluidic methods. Connecting both fundamental and applied research domains under a uniform terminology and structure would enhance field communication and scientific results. Since it is important to ensure the preservation of precious evidence throughout expertise, non-destructive techniques certainly have an advantage. Further, the application of sustainable concepts in chemistry and the emergence of mobile analytical instruments have enhanced the accessibility and sustainability of forensic research. The article focusses the critical role of chemical as it resolves challenging legal issues and deals with prospective possibilities for the punishment.

Keywords: Forensic chemistry, Toxicology, Forensic investigation, legal issues.

NCFSC2025/FRS-018

Forensic Psychology: The Science of Deception, Motives, and Justice

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ABSTRACT

Forensic psychology serves as a critical nexus between psychological science and the legal system, employing psychological theories and methodologies to enhance criminal investigations, judicial processes, and offender rehabilitation. This research aims to elucidate the pivotal functions of forensic psychology in deciphering criminal behavior, evaluating legal competencies, assessing risks, and shaping courtroom dynamics. By tracing its historical trajectory, the study will underscore seminal milestones that have established forensic psychology as an indispensable facet of contemporary criminology. The investigation will delve into the psychological foundations of criminal conduct, analyzing how cognitive, biological, and social determinants influence criminal propensities, and will scrutinize the impact of mental health disorders on legal culpability. Emphasis will be placed on investigative psychology, exploring methodologies such as criminal profiling, risk assessment, and deception detection that are instrumental in offender identification and the anticipation of criminal activities. A focal point of this research is the scrutiny of legal psychology, particularly concerning the dependability of eyewitness accounts, psychological coercion leading to false confessions, and cognitive biases that may sway judicial verdicts. The study will highlight the contributions of forensic psychologists in ensuring equitable trials through assessments of trial competency, insanity defenses, and the psychological welfare of witnesses and victims. Ethical challenges inherent in forensic psychology, including potential biases in expert testimony, confidentiality dilemmas, and the moral considerations of rehabilitative initiatives for offenders, will be critically examined. Furthermore, the research will investigate contemporary advancements in the field, such as the integration of artificial intelligence in criminal profiling, the emergence of neurocriminology, and the development of psychological strategies for crime prevention. Through the analysis of case studies and empirical data, this study aspires to provide a comprehensive evaluation of how forensic psychology refines investigative methodologies, fortifies legal outcomes, and contributes to a more equitable and ethical justice system. The research will also present pertinent statistics to substantiate its findings and support its conclusions.

Keywords: Forensic Psychology, Criminal Behavior Analysis, Investigative Psychology, Eyewitness Reliability, Psychological Coercion.

NCFSC2025/FRS-019

Identification of Hot Spots of Political Violence: A Case Study on Paschim Medinipur

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ABSTRACT

Hotspot analysis is the statistical technique of crime mapping, disease tracking, urban planning, and political studies to identify a given phenomenon that shows high concentrations because of social, economic, and environmental factors leading to clustering patterns in a geographic region. Hotspot districts are districts with higher crime rates as compared to other district areas. Identification of such hotspots helps to understand crime patterns, control crimes by using efficient strategies for the police, and also proves resource-friendly. The KDE, Getis-Ord Gi*, and Moran's I show spatial clustering techniques. Political riots in Paschim Medinipur, West Bengal, rise from electoral competition, historical grievances, and socio-economic differences. In fact, election riots cause disturbance, displacement, and law and order issues. The areas mapped will explain the reasons for violence. Studying aims at identifying hotspots of violence in Paschim Medinipur, analyzing the demographic and socio-political contexts of the area, examining the trend of political violence, and finally providing recommendations for law enforcement agencies, policymakers, and civil society. To utilize a mixed-methods approach- spatial analysis, statistical modeling, and qualitative research-in the study. Data is taken from police records, election reports, and surveys. Preprocessing for accuracy. Hotspot analysis uses KDE, Getis-Ord Gi*, and Moran's I. Thematic maps are created using GIS tools like like ArcGIS, QGIS. Based on the findings, strategic interventions in reducing political violence are proposed.

Key words: Hot spot, Political violence, Karnel density, Getis-Ord Gi, Moran's I

NCFSC2025/FRS-020

Acid Attack Case in West Bengal

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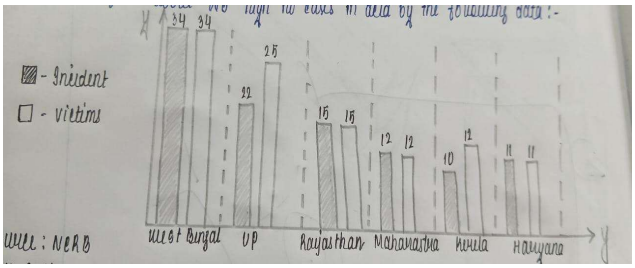
ABSTRACT

An acid attack is also called acid throwing, vitriol attack, or vitriol age. Is a form of violent assault involving the art of throwing acid on a similarly combustible substance onto the body of another "to disfigure, maim, torture or kill". The most common acids used during these attacks are sulfuric acid and nitric acid. Although

acid attacks occur worldwide, this type of violence is most common in developing nations, particularly "WEST BENGAL" & "Uttar Pradesh".



The attempt can conform to the high no of cases in acid attack by the following data:

From the above data for a specific year of the present study, the highest number of cases occurred in West Bengal. In this presentation, the present study took data from the years (2017-2021) and compared the sex, the reason behind this vigorous act, and how we can monitor to stop this.

Keywords: West Bengal, Crime Rate, Forensic Concern.

NCFSC2025/FRS-021

Comparison of Characteristics Present in Foot Marks of Different Age Group

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ABSTRACT

An essential branch of forensic science is footprint analysis. Footprints are employed at crime scenes to trace the movement, establish suspects, and determine the nature in which a crime has been committed. In this research, age differences between left and right footprints are examined. Ink and paper are employed in taking footprints, and anatomical landmarks are marked. The research employs a sample of 44 participants (44 left foot impressions and 44 right foot impressions) aged 10-59 years. Measurement analysis indicated that for left foot prints, the average age was 33.27 years with T1 (23.26 cm), T2 (22.96 cm), T3 (22.02 cm), T4 (20.83 cm), T5 (19.26 cm), BAH (4.80 cm), BAB (8.79 cm), HB Index (54.69), and FP Index (37.76); whereas right foot prints exhibited corresponding values of T1 (23.29 cm), T2 (28.68 cm), T3 (22.02 cm), T4 (20.94 cm), T5 (19.31 cm), BAH (4.84 cm), BAB (8.69 cm), HB Index (55.68), and FP Index (36.98). A number of charts and graphs are employed to prepare, clean, and present the data. For discovering significant trends, statistical tests such as t-tests and z-tests are utilized. To build statistical models for age estimation, sex estimation, weight estimation, and height estimation from footprints, the most significant features are chosen. For obtaining the best model, several models are trained and evaluated. The validity of the selected model is then verified by applying it to actual data. The application of footprints in criminal investigations is demonstrated in this paper. We enhance the application of footprints as forensic evidence by integrating data analysis, statistical testing etc.

Keywords: Footprint Morphology and Age, Footprint Analysis, Forensic Age Estimation, Statistical Analysis, Statistical Modelling.

NCFSC2025/FRS-022

Unlocking the Potential of Tongue Prints in Criminal Investigations: A Biometric Perspective

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ABSTRACT

Human identification has become a significant part of criminal investigation. Tongue prints in forensic odontology include the examination of the surface of the tongue, which possesses several distinctive characteristics such as its shape, size, depth, color tone, fissures, length, and width, which tends to be unique in every individual and is a potential method as a forensic identifier that makes them effective for identification. It is a promising biometric option just like fingerprints, as it has unique features that differ from individual to individual and even between identical twins. Tongue prints tend to remain constant throughout the individual's lifetime. Tongue prints can be an effective alternative for authentication compared to the other existing biometric authentication such as fingerprints, signatures, skin color, face recognition, and iris scan. Tongue-based authentication being inherently non-invasive and possessing distinct characteristics makes it an attractive addition or substitute for biometric tools. The current review article is an analysis of the different methods developed to define the tongue's surface landmarks that serve as marks during subsequent identification procedures, and it highlights the potential of tongue prints for human identification in criminal investigation.

Keywords: Tongue prints, human identification, biometric tool, sexual dimorphism.

NCFSC2025/FRS-023

Estimation of Stature Through Cephalon-Facial Dimensions in the West Bengal Population

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ABSTRACT

Determining identity from disfigured body parts has become crucial in forensic-medical-legal investigations due to man-made and natural disasters. Body height, or stature, is a critical aspect of identity in forensic investigations as it helps in the identification process. This study examines the correlation of height with some anthropometric measures in West Bengal for the purpose of estimating a person's height

from unknown cranial remains. The study involved 192 healthy individuals, aged 18-25, male 100 (20.18 ± 1.38) and females 92 (19.61 ± 1.48) respectively, randomly selected from in the suburban areas of Barasat, North 24-Parganas District, West Bengal, with varying heights and body types, without any congenital or acquired cephalon-maxillofacial deformations. Besides stature, nine cephalo-maxillofacial measurements were taken from each of the subjects, namely maximum head length, maximum head breadth, morphological facial height, bizygomatic length, bigonial breadth, nasal height, nasal breadth, physiognomic ear length, and physiognomic ear breadth. The results demonstrated a high influence of sexual dimorphism on the Bigonial Breadth (p=0.000), while Physiognomic Ear Breadth (p=0.000) had the least. Significant association was observed in all the selected metrics, except for the bigonial breadth, physiognomic ear length, and breadth. Linear Regression Formulae for all the metrics was created for the estimation of stature. The study concluded, that there is positive association between the stature and cephalon-facial metrics, with sex having significant influence.

Keywords: Stature Estimation, East-Indian Population, Regression Analysis

NCFSC2025/FRS-024

A Morphometric Variation of Human External Ear Lobe and its Application in the Forensic Domain

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ABSTRACT

Determining identity from disfigured body parts has become crucial in forensic-medical-legal investigations due to man-made and natural disasters. Body height, or stature, is a critical aspect of identity in forensic investigations as it helps in the identification process. This study examines the correlation of height with some anthropometric measures in West Bengal for the purpose of estimating a person's height from unknown cranial remains. The study involved 192 healthy individuals, aged 18-25, male 100 (20.18 ± 1.38) and females 92 (19.61 ± 1.48) respectively, randomly selected from in the suburban areas of Barasat, North 24-Parganas District, West Bengal, with varying heights and body types, without any congenital or acquired cephalon-maxillofacial deformations. Besides stature, nine cephalo-maxillofacial measurements were taken from each of the subjects, namely maximum head length, maximum head breadth, morphological facial height, bizygomatic length, bigonial breadth, nasal height, nasal breadth, physiognomic ear length, and physiognomic ear breadth. The results demonstrated a high influence of sexual dimorphism on the Bigonial Breadth (p=0.000), while Physiognomic Ear Breadth (p=0.000) had the least. Significant association was observed in all the selected metrics, except for the bigonial breadth, physiognomic ear length, and breadth. Linear Regression Formulae for all the metrics was created for the estimation of stature. The study concluded, that there is positive association between the stature and cephalon-facial metrics, with sex having significant influence.

Keywords: Stature Estimation, East-Indian Population, Regression Analysis.

NCFSC2025/FRS-025

Decoding Sexual Dimorphism Through Finger Ridge Minutiae in The Bengali Population of West Bengal

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ABSTRACT

The current attempt uses the Fork Index to quantify the probabilities that fingerprint minutiae can be used to identify a person's sex. It was carried out on the Adamas University campus in Barasat, North 24 Parganas district, West Bengal state, India. The sample was made up of 100 Bengali-speaking youth (students) from West Bengal, India (50 males and 50 females) to address this issue. All the bilateral fingerprints were collected using ink and roller techniques. All the collected prints were analyzed according to the standard classification and formula. The current study found that males have a substantially higher number of Forks and Minutiae in their fingertips than females. Furthermore, males score substantially higher mean on the Fork Index than females. The Fork Index, like previous investigations, has demonstrated sexual dimorphism. Based on such sexual dimorphism, the current study concludes that the Fork Index has the potential to be a biomarker for human sex determination and is valuable for forensic purposes.

Keywords: Finger Dermatoglyphics, Fork, Fork Index, Sexual Dimorphism.

NCFSC2025/FRS-026

Anthropometric and Somatometric Variations of the Human Nose: Implications for Forensic Identification and Sex Determination

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ABSTRACT

The study analyses nose structure using anthropometric and somatometric measurements of the nose as an identification method in forensic science while exploring variations between different people and groups. Advanced imaging technologies and statistical analysis identified age-specific patterns as well as gender and ethnic variations, which demonstrated the nose's usefulness in biometric analysis. The present study incorporated Bengali-speaking students from West Bengal, India. There are 101 college students, 51 boys (20.02±1.48) and 50 girls (19.56±1.49), aged between 18 and 25. The study revealed no significant($p<0.05$)

difference in nasal breadth between males and females. However, males exhibited significantly longer nasal lengths and a lower nasal index, while nasal projection did not show any gender differences. The findings demonstrate that nose morphology can be used for facial reconstruction, camouflage detection, criminal profiling tasks, and identifying missing persons, strengthening forensic identification methods.

Keywords: Nose Morphology, Anthropometry, Somatoscopy, Forensic.

NCFSC2025/FRS-027

Toxic Effects of Glycosides

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ABSTRACT

As Theophrastus of Hohenheim, also known as the "Father of Toxicology," famously stated, "All things are poison, and nothing is without poison; only the dose makes a thing not a poison", emphasizing a substance's effects depend on its dosage, influenced by the properties of the substance itself and the biological response of the target organism, including its receptors. Cyanides naturally develop in both geological and biological environments, with certain plants producing them as a protective mechanism against herbivores and pests. Cyanogenic glycosides upon hydrolysis, release hydrogen cyanide (HCN), which is a potent inhibitor of cellular respiration, leading to symptoms of cyanide toxicity. They serve as defense mechanisms against herbivores, have low to moderate anti-cancer, anti-inflammatory properties and are found in over 2000 plant species, including those in the Rosaceae family, notably cassava (*Manihot esculenta),* bitter almonds (*Prunus dulcis*), and cherry pits (*Prunus sp.*). Also, the cardiac glycosides inhibit Na+/K+-ATPase-pumps in the cell membranes. These pumps are concentrated with positive inotropic action and are essential for the proper functioning of cardiac myocytes, resulting in increased contractility and reduced rate of morbidity. The examples include *Nerium oleander*, *Convallaria majalis* etc. Plant-derived cyanogenic glycosides are significant in forensic investigations due to their potential use in poisonings, accidental exposures, and food-related toxicology cases. They have historically been used in intentional poisonings, by analysing biological samples. Also, forensic pathological examinations may reveal pulmonary congestion, brain hypoxia, and internal hemorrhages, characteristic of cyanide poisoning.

Keywords: cyanogenic glycosides, cardiogenic glycosides, dosage of toxicity

NCFSC2025/FRS-028

Stature Estimation through Linear Measurements of Upper Extremities: A Forensic Anthropological Study

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ABSTRACT

Personal identification from anthropometric measurements is one of the most critical things in forensic science. Stature and identification of sexes are essential criteria for personal identification. Previous studies have shown that estimating stature and gender identification from different body measurements is widely documented. The present study attempts to estimate stature through linear measurements of upper extremities. This study was performed on 100 youths (49 males;20.18±1.38 and 51 females;19.61±1.48) whose age range was between 17 to 25 years in North 24 Parganas, West Bengal. Stature, upper arm length, forearm length, sitting height, and arm span were measured in standard position using Martin's Anthropometer, Martin's Rod Compass and measuring tape. Also, anthropometric landmarks were used in the process. All the parameters showed a significant ($p<0.05$) correlation with stature in males and females at different degrees. It can be concluded that this present study has provided a regression equation for estimating stature from different parameters in both genders.

Keywords: Anthropometry, Upper Extremity, Stature Estimation, Forensic Science.

NCFSC2025/FRS-029

Forensic Speaker Recognition: A Detailed Analysis from Identification to Court

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ABSTRACT

Forensic Voice analysis, also known as Speaker recognition, can be regarded as a cornerstone in the field of forensic identification if it is employed correctly with the right machinery, equipment, intellect, and valid

supporting evidence. Forensic Voice Analysis represents a branch of forensic science dedicated to scrutinizing and authenticating individuals through their distinctive vocal attributes. Identification methodologies include the utilization of unique features such as pitch, pronunciation, tone, speech patterns, linguistic traits, and accents of different individuals to identify or individualize them. Through the careful study of specific linguistic characteristics, speech patterns, and accents, it is possible, with the help of this identification technique to create voice profiles of criminals or suspected individuals for comparison, aiding in criminal investigations. While there have been a significant number of technological advancements in the machinery and the methodologies employed in this examination technique using sophisticated software and algorithms, the admissibility of voice evidence as a concrete source of evidence has the potential to influence the final verdict in the court of law still to this day remains debatable. Factors such as the influence of the background or environment, variations in speech due to age or disease, and distortion in voice recordings due to faulty equipment can have a noteworthy impact on its accuracy. They can raise questions about its reliability in legal contexts. Hence, while Forensic Voice

Analysis is a valuable tool for identifying individuals, caution is essential when employing it as forensic evidence.

Keywords: Forensic Science, Voice Identification, Personal Identification

NCFSC2025/FRS-030

The Role of Click Chemistry in Modern Forensics: New Frontiers in Evidence Handling

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ABSTRACT:

Click chemistry, introduced by K. Barry Sharpless in 2001, is a highly efficient chemical strategy characterized by high yield, specificity, and minimal byproducts. It has gained widespread interest in fields like biochemistry, materials science, and forensic analysis, particularly due to its use of azide-alkyne cycloaddition. In forensic science, click chemistry enhances the sensitivity and specificity of methods used for criminal investigations. It facilitates the rapid tagging of biological samples and trace evidence, and the creation of unique molecular markers to track substances, identify DNA, and improve detection at crime scenes. Additionally, it aids in the development of imaging agents for precise visualization and localization

of evidence. Applications in forensic toxicology, bloodstain pattern analysis, and the detection of illicit substances show its potential to revolutionize traditional forensic techniques. This review highlights how click chemistry contributes to evidence handling, analysis, and investigative advancements in forensic science.

Keywords: Chemical; Cycloaddition; Forensic; Markers.

NCFSC2025/FRS-031

Use Of Forensic Psycholinguistics in Detection of Psychopaths for Proper Law Enforcement

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ABSTRACT

Forensic psycholinguistics is a sub-discipline of forensic linguistics that analyses **language** to solve crimes committed by psychopaths as it is believed that the language of the psychopaths contains a rich source of information on their dysfunctional emotionality and personality. According to research psychopaths have frequently been described as displaying **semantic dementia**(a progressive brain disease that causes a loss of semantic memory, or the ability to understand words and their meanings) and it is believed that their speech is empty as they use **"words without meaning"** and are blind to the meaning of words. Psychopathic murderers differ from non-psychopathic murderers due to the presence of characteristics such as distinctive speech patterns (absence of coherence) , fewer social references, selfish goal-driven narratives and deficits in recognizing emotions and skilfully portraying fake expressions and manipulate others, often displaying "duping delight" through lies to escape situations. Because of its relevance to law enforcement, corrections, the courts, and others working in related fields, the need to understand psychopathy cannot be overstated because of which psycholinguistics, particularly through Language Analysis (LA), investigate the speech of individuals with psychopathic traits as through this method one can venture deeper into the surface of spoken words to reveal underlying **emotions, thoughts,** and **psychological states**. In India, **Section 84 of the Indian Penal Code** addresses criminal responsibility in cases of "unsoundness of mind." However, the distinction between medical and legal insanity remains unclear. Understanding psychopathy is crucial for law enforcement, corrections, and the courts. Forensic psycholinguistics offers valuable insights into the language of psychopaths, aiding in crime solution and prevention.

Keywords: Forensic psycholinguistics, semantic dementia

Poster presentations:

NCFSC2025/FRS-032

Crime Scene Investigation

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ABSTRACT

Crime Scene Investigation (CSI) is a specialized discipline within forensic science focused on the collection, examination, and analysis of physical evidence from crime scenes. CSI professionals employ various forensic techniques to process DNA, fingerprints, fibers, and digital evidence, aiding law enforcement in solving criminal cases. Several undercover agencies worldwide integrate forensic science with covert operations. Artificial Intelligence (AI) is significantly transforming forensic investigation. Forensic experts utilize advanced lighting techniques to detect hidden evidences. The closure of a crime scene investigation involves thorough evidence collection, documentation, and forensic analysis. This ensures that all findings support legal proceedings and contribute to an accurate resolution of the case.

Keywords: **Crime Scene Investigation, Methods, Forensic Science.**

NCFSC2025/FRS-033

Eyes On the Crimes of The Capital of India -New Delhi

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ABSTRACT

The growing crime rate is a huge concern and it needs the utmost attention to put a seal on its growth. Crime in India is recorded annually maintained by the National Crime Record Bureau (NCRB), working under the Ministry of Home Affairs, Government of India. In 2022, crime rate registered in India under IPC crimes is 258.1% while in 2011 it was 192.2% which shows there is an increase in rates by 34.33%. New Delhi, had a crime rate of 1952.5 in 2022 and 318.5 in 2011 per lakh population. The trends of different Heinous Crimes as per data found exhibits a sharp increase in 2014-2015 reaching the highest summit moderately decreasing in the ensuing years. Among the heinous crime observed in a decade robbery has been at its highest peak in 2015 (11187). The Non-Heinous Crime reported frequently which portrays significant increase over the time period. The most reported one is Motor Vehicle Theft which is highest in 2019

(46433). The total IPC Crime Data across the year 2011-2022 in New Delhi exhibits that there is upward trend in the middle years. In 2019, highest number IPC crimes (301085) have been recorded showing the percentage of 13.5%. In crime against women data- Assault on women with intend to outrage her modesty has been observed maximum in 2015 (5367).

Keywords: IPC Crimes, Heinous Crimes, Non-Heinous crime, Crime Against Women

NCFSC2025/FRS-034

Khoji System 2.O: A New Era in Footprint Analysis

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ABSTRACT

Footprints refer to the impressions left by a person , have a hidden language about the event, is used for identification, containing distinctive characteristics – dimension, toe marks, etc. Footprints are found at the crime scenes. Collecting methods(Modern technology) – photography, tracing, lifting , casting .Greater chances of footprints damage happen than any other left traces by the criminal. The khoji system was practiced by traditional Indian trackers ,it's unique features link the suspect with the crime .Key steps in this system includes examination ,comparison with known prints, documentation. This is primarily associated with India, regions like – Rajasthan ,Punjab & Gujarat where a community of people , known as "khoji" they are skilled at identifying unique features – unusual tread marks and deformities . Some of the notable cases where this system was used are the barefoot bandit, lone wolf and Punjab murder case. Main difference between Khoji system and modern technology of footprint is that the khoji system does not focus on the basic shape of a footprint , analyses smaller details that might be missed by modern technology. As the modern technology relies on digital tools – 3D scanning and modelling, the khoji system relies on specialised knowledge. This system has several benefits including ability to be used in remote / rural areas , it's cost effectiveness. According to forensic experts khoji system combined with modern technology provides a more comprehensive analysis which will increase the chances of solving the unsolved cases by ~5%.This combine system can achieve revolution in solving crimes.

Keywords - Footprint , Khoji System , Forensic.

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Contagious Delusions: Unravelling Folie À Deux

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ABSTRACT

Shared psychosis, also known as folie à deux or induced delusional disorder, represents a fascinating phenomenon where psychotic symptoms, particularly delusions, are transmitted from one individual (the primary case) to another person or persons (the secondary cases) who are in close emotional proximity. The development of shared psychosis typically requires specific conditions: an intense emotional bond between individuals, relative social isolation, and a power dynamic where the primary case holds significant psychological influence over the secondary cases. The primary individual usually exhibits a more severe and established psychotic disorder, while the secondary participants may be more susceptible due to various factors including personality traits, cognitive vulnerability, or existing mental health challenges. Understanding shared psychosis provides valuable insights into the social contagion of beliefs and the role of interpersonal relationships in mental health, making it relevant not only to clinical practice but also to our broader understanding of human psychology and social influence. The forensic psychological approach to shared psychosis requires a delicate balance between clinical understanding and legal application. Success depends on careful assessment, appropriate intervention, and ongoing monitoring of all involved parties. This study ensures both judicial fairness and therapeutic effectiveness while protecting public safety. The main motive od this study is to make the audience aware about the term "shared-psychosis", identify the warning signs of mass hysteria, paranoia, and psychological control among acquaintances along with the importance of recognizing and addressing shared psychotic disorders; and lastly to address the need for better mental health awareness and support systems.

Keywords: Shared-Psychosis, Forensic approach, Paranoia, Psychotic disorders.

NCFSC2025/FRS-036

Evolution of Modus Operandi and Trophy Collection in Serial Killing: A Comparative Analysis of Vintage and Contemporary Cases

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ABSTRACT

Serial murder, a sophisticated and sinister crime, has fascinated mass and scholarly audiences for several centuries. Describing itself as repeated deadly violence committed by an individual or group of people, serial murder transcends homicide to a spectacle in psychology and ritual. Modus Operandi (MO) refers to the particular mode or pattern a criminal uses when committing a crime. It includes methods, tools, victim profiling, and means of escape. Investigators analyse MO to establish crime patterns, link cases, and profile offenders, which can aid criminal investigations and prevention. Every serial killer's modus operandi (MO) is distinctive, more of a behavioural fingerprint that changes over time based on psychological motivators, personal history, and situational tensions. The most important characteristic of serial killers' psychology is the trophy collection and signature left at the scene of the crime. Trophies can extend from victims' personal items to symbolic objects and are used as reminders of their crime, affirming their identity and sense of power. These are highly important when considering offenders' psychological processes, motivations, and behaviour. This study aims to compare serial killers of 21st-century and 20th-century in their MO, signature, and trophy-taking behaviour by analysing six vintage cases, viz., Trailakya Tarini, H.H. Holmes, the Zodiac Killer, Ted Bundy, Jeffrey Dahmer, and Jack the Ripper—and six contemporary killers—Israel Keyes, Luca Magnotta, the Dark Web Cannibal, Todd Kohlhepp, Samuel Little, and Stephen Port. Advances in forensic science, media attention, and online tracks have made huge transformations in the methods of modern killers. Through the examination of such trends, this study hopes to learn about how police, technical, and social developments have shaped the actions of serial killers. This work also strives to learn about long-term psychological characteristics that transcend time. This study ultimately assists in profiling serial offenders, contributes to academic literature, and enhances criminology and forensic science investigative techniques.

Keywords: Serial killing, Criminology, Modus Operandi, Trophy

NCFSC2025/FRS-037

Review of Robust Ink Analysis through Thin Layer Chromatography

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ABSTRACT

Ink analysis plays a crucial role in the examination of questioned documents, such as forged checks, wills, or altered records. While most blue or black inks may appear identical to the naked eye, their chemical composition can vary significantly. Laboratory analysis can reveal these differences, helping determine whether any additions or alterations have been made to a document, as different inks have distinct compositions. Various techniques are employed for ink analysis, which can be either non-destructive or destructive, depending on whether a sample needs to be extracted from the document. Non-destructive methods include spectroscopy and Thin Layer Chromatography (TLC), among others. TLC is a widely used technique in ink analysis as it effectively separates ink components based on their chemical properties. In this study, we try to investigate the impact to TLC in ink analysis. A small ink sample is applied to a TLC plate, and a solvent is used to carry the components across the plate. This process allows forensic experts to observe distinct ink patterns and compare them with known samples. The ink sample is placed in a test tube with a solvent that dissolves the ink, and a small drop of the solution is spotted onto the TLC plate. The final result is a pattern of colored spots, known as a chromatogram, which is unique to each ink. Since different inks produce distinct chromatograms, this method aids in identification. In conclusion, ink analysis using TLC helps forensic experts establish connections between documents in cases of forgery or document disputes. Additionally, it is valuable in analyzing different types of inks and their dye constituents.

Keywords: Ink Analysis, Ink Composition , Thin Layer Chromatography.

NCFSC2025/FRS-038

Veil of Deception: The Mask of Sanity

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ABSTRACT

This study explores four categories of individuals in relation to crime, with a particular focus on those who unknowingly commit wrongful acts. By examining psychological patterns, it highlights the factors that contribute to criminal behavior and the gradual shift from normalcy to transgression. Central to this investigation is the role of forensic psychology, profiling, and

behavioral analysis in understanding and predicting criminal tendencies. The research delves into the duality of human nature—where deception coexists with charm, and truth blurs with manipulation—shedding light on the complex psychological forces that drive individuals toward unlawful actions. Beyond the overt manifestations of crime, the study uncovers the subtle psychological transitions that occur in individuals as they navigate moral dilemmas, social pressures, and personal justifications. It explores how faith and fear intertwine, influencing decisions that can lead to criminal acts, whether consciously or unconsciously. By analyzing behavioral changes and patterns in a criminal's journey, the study challenges conventional notions of guilt and innocence, revealing how deception can be masked by persuasion and how manipulation can be mistaken for trust. Ultimately, this study seeks to deepen our understanding of the blurred boundaries between right and wrong, urging a reconsideration of how society perceives crime and criminal intent. As the lines between myth and reality shift, a critical question emerges: who truly wears the mask, and who has the courage to see beyond the illusion?

Keywords: Criminal profiling, Unspoken void, Faith, Behavioral changes, Criminal behaviour.

NCFSC2025/FRS-039

Tiny Clues, Big Breakthroughs: The Power of Nanotech in Criminal Investigations

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ABSTRACT

Nanotechnology, the science of manipulating materials at the atomic and molecular levels, has significantly enhanced forensic science and criminal investigations. With its precision and sensitivity, nanotechnology aids in evidence collection, analysis, and crime detection, improving accuracy in solving crimes. The primary objective of nanotechnology in forensic science is to enhance the accuracy, sensitivity, and efficiency of crime detection, evidence analysis, and criminal investigations. By utilizing nanoscale materials and technologies, forensic experts can improve various investigative processes, ensuring more reliable and precise results. Nanoparticles, such as gold and silver nanostructures, are used in fingerprint detection, making latent prints more visible on various surfaces. Nano-sensors and nanoprobes enhance

DNA and drug analysis, ensuring more reliable identification of suspects. Additionally, quantum dots and nano-enhanced spectroscopic techniques improve forensic imaging, helping detect trace evidence like gunshot residues, explosives, and toxic substances. In forensic toxicology, nanotechnology enables rapid drug and poison detection in biological samples, providing crucial evidence in criminal cases. Nano-enhanced polymer coatings improve forensic tools, increasing their durability and precision. Moreover, nanomaterials aid in environmental forensics by detecting pollutants and residues at crime scenes, supporting investigations related to chemical attacks or environmental crimes. The application of nanotechnology in forensic science has led to significant advancements in crime detection, evidence analysis, and criminal investigations. In this study we are trying to establish that nanotechnology is the future of forensic science and how it helps to detect the untraceable evidence which further helps in the investigation.

Keywords: Nanotechnology, Nano-senser, Forensic Tools, Nanoprobes, Nanoparticles.

NCFSC2025/FRS-040

Unmasking Digital Deception: The Role of Forensics in Social Media Investigation

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ABSTRACT

Social media forensics involves the application of digital forensics techniques to investigate and analyze social media data for legal or investigative purposes. With the growing use of platforms like Facebook, Twitter, Instagram, and LinkedIn, these tools have become increasingly vital for law enforcement, legal professionals, and investigators. This process encompasses various techniques, including data collection, analysis, and preservation. Investigators often rely on specialized software and tools to extract data from social media platforms, such as user profiles, posts, comments, and private messages. They also examine metadata linked to social media content, including timestamps, geolocation, and device details.

Social media forensics is used in cases like cyberbullying, harassment, defamation, and fraud. Ensuring proper procedures and using reliable tools are crucial to maintaining the integrity of the investigation. Fraudsters frequently target vulnerable older adults, and victims have lost large sums through some of the more prevalent schemes. In this paper we will discuss about some rising issues that can be termed as social media crimes and various ways and websites like Jatheon, WebPreserver, Pipl, TinEye etc that are used as “Forensic Tools” to solve and bring justice to these kinds of cases. Also, we will discuss about ways to avoid being a victim to such crimes and necessary steps to take if one falls victim to such crimes.

Keywords: Social Media, Forensic Analysis, Cyber Bullying, Digital Forensics, Harassment.

NCFSC2025/FRS-041

Forensic Entomology : Insects as Silent Witnesses

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ABSTRACT

Forensic entomology is a crucial branch of forensic science that utilizes insect activity to estimate the postmortem interval (PMI) and provide evidence in criminal investigations. Insects, particularly necrophagous species like blowflies (Calliphoridae) and beetles (Silphidae, Dermestidae), are among the first to colonize a decomposing body. Their predictable life cycles and succession patterns help forensic experts determine the time since death, location of decomposition, and potential movement of remains.

Beyond PMI estimation, insects also serve as bioindicators of environmental conditions and possible causes of death. Through entomotoxicology, the analysis of insect tissues can reveal the presence of drugs, toxins, or poisons when human tissues are no longer available. This is particularly valuable in cases of suspected poisoning or drug overdose.

The collection of insects at different life stages—eggs, larvae, pupae, and adults—is essential for accurate analysis. Proper preservation and documentation ensure reliable species identification and developmental analysis. Despite challenges such as environmental influences and insect metabolism of toxins, forensic entomology remains a powerful tool in medico-legal investigations.

Insects act as silent witnesses, preserving forensic evidence long after other biological traces have vanished. Their role in forensic science helps reconstruct events surrounding death, aiding law enforcement in solving crimes and delivering justice. As research advances, forensic entomology continues to evolve, enhancing its reliability and application in criminal cases worldwide.

Keywords: Entomology; Post-mortem interval ; Insects; entomo-toxicology.

NCFSC2025/FRS-042

Serial Killer as Human

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ABSTRACT

Serial killers are individuals who commit multiple murders over a period of time, with a psychological motivation and a modus operandi. The modus operandi of a serial killer ranges from sexual abuse, torture, humiliation and domination. These crimes typically involve a level of

planning, control, and own pleasure. According to the Federal bureau of investigation serial homicide is the unlawful killing of two or more victims in seperate events. Research says that serial killers generally have a traumatic childhood, with experiences of abuse, neglect, or instability due to which they become insensitive and may lead to mental trauma. Studies have identified several key characteristics common among serial killers, including manipulation skills, a lack of empathy and impulsivity, and an interest in violence, death, and supernatural things. The motivations behind serial killing can vary, but common themes include a desire for control and power over victims, sexual desires, revenge for past traumas, and a desire for fame or attention-seeking. These characteristics and motivations can vary across individuals, but they provide

Serial killers can be categorized into seven main types based on their motivations and characteristic they include :Hedonistic serial killers ,Power and control serial killers, Mission-oriented serial killers ,Visionary serial killers , Comfort serial killers, Thrill serial killers and revenge serial killers . As per criminology strain theory ,social learning theory, routine activity Theory and social control theory help explain the motive and methods of serial murders.

Keywords: Homicide, Psychopathy, Motivation , Types And Criminology .

NCFSC2025/FRS-043

The Night Stalker Case

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ABSTRACT

Richard Ramirez was a notorious American serial murderer and rapist who perpetrated a chain of heinous murders, burglaries, and rapes of various victims along Southern California in the period from 1984 to 1985. Ramirez's crimes involved mainly random targets with home invasion, and their nature was extremely violent, with elements of satanic rituals, terror, etc. Ramirez killed victims by shooting, stabbing, and bludgeoning them and also left clues of cryptic messages with implications for Satanism. He was finally apprehended in 1985 after being spotted by a group of people who had seen him on television and in the press. Ramirez went to trial in 1988 and was found guilty in 1989 of 13 murders, 5 attempted murders, 11 sexual assaults, and 14 burglaries. He was sentenced to death but languished on death row at San Quentin State Prison for decades. Ramirez succumbed to complications of cancer in 2013. His is one of the most well-known cases of notorious American serial offenses because he provoked so much terror among the people and his acts were so grim.

Keywords: Serial Killer, America.

NCFSC2025/FRS-044

Unseen Danger: The Impact of Drug Facilitated Sexual Assault

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ABSTRACT

Date rape (or acquaintance rape) is forceful sexual assault of a person from someone they know. Date rape drugs (Drug facilitated sexual assault) are those substances which are illegal and used to sexually assault an individual or take advantage of them. Due to these drugs the rape cases has gradually increased over the years as it cannot be easily detected by the victims due to its different properties. Date rape drugs can be mainly in form of GHB, Rohypnol (flunitrazepam), ketamine. It can affect our nervous system which may lead to short term memory loss and unconsciousness as well as make us hallucinate. It can also lead to seizures and lower the blood pressure. GC-MS and LC-MS are mostly used in detecting the date rape drugs. A new indicator nail polish developed by 4 college students at North Carolina State University that changes colour in presence of date rape drugs. Through the study, we are reviewing how date rape drugs lay an impact on the physiology and psychology of an individual, and its forensic analysis techniques. In Forensic science date rape drugs plays a crucial role as it helps in drug identification in biological samples thus leading to forensic investigation.it also helps to connect the victim and suspect to the scene of crime. Many date rape drugs cases remain unreported in India which makes it an even more crucial topic in Forensic Science studied statistically.

Keywords: Date rape drugs, indicator nail polish, detection techniques, forensic application.

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Ghost Gun – New challenges of Forensic World

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ABSTRACT

Homemade and improvised firearms, commonly known as "ghost guns," present significant challenges for forensic investigators and law enforcement agencies. These unregistered firearms, frequently assembled from kits or manufactured using 3D-printing technology, lack serial numbers and traditional firearm markings, making conventional tracing methods ineffective. The increasing

accessibility of firearm blueprints and CNC machining further complicates the issue, enabling the widespread production of undetectable weapons. This paper examines the forensic challenges associated with ghost guns, including difficulties in ballistic analysis, material identification, and crime scene investigations. Additionally, it explores advanced forensic techniques, such as 3D-printer trace analysis, chemical composition testing, and DNA/fingerprint recovery from firearm components. Furthermore, legal and policy measures aimed at curbing the proliferation of ghost guns, including enhanced regulations on firearm kits, digital blueprint restrictions, and mandatory serialization, are discussed. By addressing forensic and regulatory gaps, this study aims to provide a comprehensive overview of the evolving landscape of ghost gun investigations and propose potential countermeasures to mitigate their impact on public safety.

Keywords: Ghost Gun; challenges; legal measures; countermeasures

NCFSC2025/FRS-046

Crime Statistics of Madhya Pradesh: A Closer Look

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ABSTRACT

Madhya Pradesh has been a high-crime state and hence a prime focus for research on India's crime pattern. This report brings to light prominent offenses such as rape, murder, robbery, abuse of narcotics, cybercrime, and child abuse based on statistical analysis and case studies. The state experienced oscillating rape cases, with a steep rise in 2021. High-profile cases like the Vyapam scam deaths and the Mhow Army officers' assault case also expose entrenched corruption and security failures. Infamous cases like the Jhabua rape and the Ramesh Khati serial rape-murder case expose systemic failures in law enforcement and the judiciary. Indore and Gwalior have the highest crime rates in murder and robbery, and Madhya Pradesh stands sixth in the country in the abuse of drugs. Cybercrime has increased with monetary losses of over ₹160 crore. Child abuse continues to be a cause of concern, with the state topping in crimes against children, such as child marriages and teenage pregnancies. Missing children's cases also reflect weak child protection mechanisms. Despite policies and police enforcement, underreporting, low conviction rates, and judicial loopholes hold crime control back. Law enforcement must be strengthened, victim support ensured, and proactive strategies for preventing crime to ensure better safety in Madhya Pradesh. This report is based on crime scene reports, case studies, legal reports, crime maps, and research articles.

Keywords: Madhya Pradesh, Crime Rate, Forensic.

NCFSC2025/FRS-047

Neurocrimonology: The Link Between Abnormalities and Criminal Behavior

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ABSTRACT

Neurocriminology is a versatile field that examines the relationship between abnormalities and criminal behavior. It amalgamates neuroscience, psychology, criminology to explore how structural and functional deficits in the brain contribute to violent inclination. Research indicates that impairments in the key brain region, such as the prefrontal cortex, amygdala, and limbic system are associated with recklessness, aggression and lack of empathy − traits commonly found in criminal offenders. For instance, reduced activity in the prefrontal cortex is responsible for impulse control and decision making, which has a direct link to the violent crimes occuring so far. Similarly an overactive amygdala may intensify aggression and emotional instability.Genetic predispositions, prenatal factors, and environmental influences, such as childhood trauma and substance abuse, leads to neural development and increase the risk of criminality. Neuroimaging studies, including fMRI and PET scans, have provided compelling evidence of structural and functional deviations in the brain of offenders. Research indicates a like between psychopathy and antisocial personality disorder and demonstrable abnormalities in brain structure and function. There we have some case studies relating to neurocriminology which help us to analyse the link, -Richard Ramirez (Night Stalker, had a history of childhood head injuries), Charles Whitman (Brain Tumor) and Phineas Gage (Personality disorder).Understanding the neurological basis of criminal behavior has significant implications for crime prevention, rehabilitation, and legal policies. To advance the field it is essential to share knowledge and collaborate aross disciplines and borders. International conferences, workshops, and research can provide a platform for experts to share their findings, discuss challenges and develop new research agendas.

Keywords: Neurocriminology, Antisocial Personality, Criminal, Psychopaths.

NCFSC2025/FRS-048

Assam Crime Atlas

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ABSTRACT

A visual representation of crime patterns and incidents in a given area. Crime analysts use crime mapping to help identify crime trends, hot spots, and patterns. This information can help police departments allocate resources, solve crimes, and develop effective strategies to reduce crime. According to recent data, Assam is considered to have one of the highest crime rates in India, often ranking among the top states in terms of overall crime, particularly crimes against women, placing it far from the "6th rate" position; in many reports, it is frequently listed as having the highest crime rate in the country. Assam is known for Assam tea and Assam silk. The state was the first site for oil drilling in Asia. According to NCRB data, Dhubri district in Assam has the highest number of reported crimes against women. Morigaon and Guwahati city also have high crime rates.

Keywords: Crime Patterns , Assam, Forensic.

NCFSC2025/FRS-049

Implication of AI for Forensic Voice Analysis: A Review of Automatic Detection of Disguised Voices

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ABSTRACT

This study focuses on the question of voice disguise and its detection. Voice disguise is considered as a deliberate action of the speaker who wants to falsify or to conceal his identity; the problem of voice alteration caused by channel distortion is not presented in this work. A large range of options are open to a speaker to change his voice and to trick a human ear or an automatic system. A voice can be transformed by electronic scrambling or more simply by exploiting intra-speaker variability: modification of pitch, modification of the position of the articulators as lips or tongue which affect the formant frequencies. The proposed work is divided in three parts: the first one is

a classification of the different options available for changing one's voice, the second one presents a review of the different techniques in the literature and the third one describes the main indicators proposed in the literature to distinguish a disguised voice from the original voice, and proposes some perspectives based on disordered and emotional speech.

Keywords: Disguised voice, Automatic detection, Forensic Analysis.

NCFSC2025/FRS-050

Unveiling the Secrets of Gemstones: A Scientific Approach to Identifying and Authenticating Gemstones in the Forensic Perspective

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ABSTRACT

Forensic analysis of gemstones involves the application of scientific techniques to identify, authenticate, and trace the origin of gemstones in criminal investigations, theft cases, and legal disputes. Gemstones, prized for their rarity and value, are often subject to fraud, smuggling, and misrepresentation, necessitating the use of advanced analytical methods to establish their legitimacy. Key forensic techniques used in gemstone analysis include microscopy, spectroscopy (e.g., Raman and X-ray fluorescence), and chromatography, which provide detailed insights into the gemstone's composition, inclusions, color characteristics, and geological origin. Additionally, isotopic and trace element analysis plays a crucial role in determining the geographical source of gemstones, offering crucial evidence in criminal cases. The integration of these methods allows forensic experts to differentiate between natural and synthetic stones, detect treatments or enhancements, and provide invaluable evidence for both law enforcement and the legal community. This paper explores the various forensic methods employed in gemstone analysis, their applications in criminal investigations, and the challenges involved in maintaining accuracy and reliability in such analyses.

Keywords: Gemstones; Forensic; Microscopy; Spectroscopy

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