



Conference Proceedings

COST Action CA22106 (MDVI)

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Introduction

Speaker: Prof. Caroline Wilkinson, Action Chair

Summary / Notes: Welcome to the first annual conference for Migrant Disaster Victim Identification. This online conference is sponsored by the European Cooperation in Science & Technology (COST) with European Union funding.

The challenge this action aims to address is the global humanitarian crisis related to migrant disasters and the unidentified dead. Thousands of migrants attempt to cross bodies of water and inhospitable land masses between their countries of origin and arrival. Sadly, many migrants lose their lives during the migratory route, and their identities may never be established. It is an international moral necessity to attempt identification for each deceased person for legal and/or family matters, and this can be especially challenging in mass fatalities. Currently approx. 25% of migrant disaster victims are formally identified. The International Organisation for Migration (IOM) estimates >30k deceased migrants to Mediterranean alone since 2014, and IOM's Missing Migrants Project recorded 200% increase in deaths on Eastern Mediterranean land route between 2021-2022. In addition, the IOM estimates >4k deaths via West African sea route to Canary Islands over last 10 years, and the United Nations states 2023 was deadliest year for migrants in a decade.



In this Action, interdisciplinary research and coordinated initiatives (meetings, training schools, short term scientific missions and online resources) will drive the development and validation of international processes and resources, including the utilization of innovative craniofacial, drone, AI and social media methods.

The Action includes four Working Groups: Physical evidence, Digital evidence, International policy and Continued Professional Development (CPD) programme. Currently we have 177 members from 35 countries made up of 49% from International Target Countries (ITC), 46% Young Researchers/Innovators and 60% female. The Action has a Management Committee made up of 29 members from 21 COST member countries, of which 67% are ITC. The Action has a Core group made up of the Chair, Vice-Chair, Grantholder Manager, Science Communication Officer and the Working Group Co-Leaders.

Our action has identified a number of research coordination objectives and capacity building objectives, and these include:

Research Coordination: Develop a common understanding; Coordinate research and impact; Focus on new methods/technology – craniofacial, drones, social media, AI; Produce recommendations/standards/guidelines; Develop a central shared database.

Capacity Building: Foster knowledge exchange; Influence international policy and processes; Provide accessible training; Collaborate with migrant diaspora and family/community groups; Act as a stakeholder platform; Build capacity across Europe.

KEYNOTE ADDRESS

Mr. Vasco Malta opened the conference as invited keynote speaker. He is the Head of Office of IOM Portugal and has been a lawyer since 2005, and started his work in the human rights area within the High Commissioner for Migration and Intercultural Dialogue, in Portugal in 2009. He was appointed as Deputy of the High Commissioner for Migration in Portugal, and in 2019, as Head of Migration Policy, International Relations, Enrolment of Migrants of the High Commissioner for Migration. Following this he was appointed as Deputy of the Portuguese Minister of Home Affairs, with the areas of migration, refugees, and traffic of human beings and then as Head of Mission of the International Organization for Migration (IOM) (United Nations Migration Agency) in Portugal. He was awarded the Order of Rio Branco by the Brazilian Government/President of Brazil, for the “services provided in favour of migrants over the last 15 years”.



Mr Malta discussed what makes a migrant and highlighted the global statistics relating to migration, undocumented migration and forced migration. He asked the conference to consider a number of cases to illustrate the difficulties migrants face that lead them to leave their home country.

Rights-informed policy development



Melanie Klinkner

Summary: This presentation discussed The Bournemouth Protocol on Mass Grave Protection and Investigation by Bournemouth University ([The Bournemouth Protocol on Mass Grave Protection and Investigation by Bournemouth University - Issuu](#)) from an international human rights law perspective.

[PRESENTATION](#)

Migrant Victim Identification: Challenges and Field-Proven Solutions

Eleanor R. Benson

Summary / Notes: Eleanor gave a presentation of a new fingerprinting technology by Integrated Biometrics (IB), which has shown promise for collecting data in the field.

The IB fingerprinting technology uses LES sensor film, which emits light when conductive material, such as skin, touches it. The film is therefore able to show fingerprints in very high detail, and the devices are easy to use and transport. The theoretical presentation was substantiated by examples of uses in both criminal cases and in DVI as well as scientific studies showing the applicability of the technology. Eleanor also gave a practical demonstration of the technology by letting the audience try a portable version of the machine



[PRESENTATION](#)

Unnamed: The Phenomenon of Migrant Disaster Victim Identification in Europe

Veronica Martinez-Garcia



Summary / Notes: This communication presents the report “Unnamed: The Phenomenon of Migrant Disaster Victim Identification in Europe”, authored by Veronica Martinez-Garcia, Trine Olsen, and Caroline Wilkinson. The report investigates the emerging field of Migrant Disaster Victim Identification (MDVI), which addresses the systematic challenges of identifying migrants who die during their journeys to Europe. Over the past decade, more than 30,000 migrants have lost their lives in this context, and more than 23,000 remain unidentified.

The presentation outlines the report’s structure and main findings, organised around three analytical axes. The first concerns data collection: how migrant deaths and disappearances are recorded, the discrepancies between official and non-official sources, and the absence of centralised registers. The second axis examines migration and border policies at European, regional, and national levels, showing how fragmented approaches contribute to the scale of MDVI. The third explores the operational processes of identification, underlining gaps in forensic capacity, the lack of harmonised standards, and the limited involvement of families.

Attention is also given to the legal and ethical obligations of states, grounded in Human Rights Law, International Maritime Law, and International Humanitarian Law. These frameworks establish clear duties of rescue, investigation, and identification, yet practice often falls short. The report's recommendations are highlighted, including improved coordination, standardised procedures, dedicated training, and the creation of specialised forensic units.

Overall, the presentation disseminates the report's contribution to academic and policy debates, situating MDVI as a pressing humanitarian, legal, and ethical issue. It emphasises the urgent need to restore dignity to deceased migrants by ensuring that identification processes are effective, coordinated, and respectful of fundamental rights.

[PRESENTATION](#)

From Digital Traces to Humanitarian Intelligence: A Multimodal Architecture for Migrant Disappearance Data

Fevzi Esen



Summary / Notes: The disappearance of migrants represents a critical humanitarian and ethical challenge that continues to expose major weaknesses in data coordination, accountability, and protection mechanisms. Conventional systems such as border control records, forensic registries, and NGO databases often fail to provide timely or complete information, leaving families and institutions without reliable evidence to guide search or identification processes. This study presents an ethics-integrated humanitarian data infrastructure that systematically transforms multimodal digital traces produced by migrants and their communities, including geotags, social media posts, photos, and “last-seen” indicators, into verified and ethically governed information. A typology of 32 digital trace types across ten domains was developed to guide structured data collection and interoperability. The framework operates through five interconnected cores: data ingestion and verification, multimodal preprocessing, evidence integration, AI-driven analysis, and an intelligence core. Together, these components enable entity resolution, spatiotemporal reconstruction, and explainable artificial intelligence, supported by embedded safeguards for consent, privacy, provenance tracking, and auditability in accordance with FAIR and human rights principles. The system integrates computational analytics with human-in-the-loop validation to generate real-time humanitarian intelligence. This includes predictive models, geospatial mapping, and early-warning dashboards that support field coordination, policy development, and family notification processes.

Emphasizing human oversight and survivor-centered governance, the framework aims to bridge digital evidence with humanitarian action in a transparent, accountable, and ethically sustainable manner.

By uniting data science with humanitarian ethics, this study offers a replicable model for converting fragmented digital information into credible, actionable intelligence. It highlights how ethically guided technological infrastructures can strengthen identification efforts, improve data integrity, and ultimately restore dignity to migrants and families affected by disappearance.

[PRESENTATION](#)

Dental Age Estimation in Migration and Asylum: Artificial Intelligence for Dental Age Assessment Presentation

Cristiana Palmela Pereira



Introduction

Forensic odontology has long been fundamental to human identification, particularly in disaster victim identification (DVI), missing-person investigations, and postmortem–antemortem (PM–AM) data comparison. Conventional manual comparison of dental radiographs remains time-consuming and subjective, especially when large volumes of data are involved. Artificial intelligence (AI) now offers the potential to transform this process by introducing automation, reproducibility, and analytical precision. In this context, the presentation delivered at the COST Action CA22106 – MDVI Conference (Lisbon, 23–24 September 2025) introduced the AIdentifyAGE project (FCT Grant 2024.07444.IACDC), which develops AI-based decision-support systems for dental age assessment and forensic applications. The

presentation described the development of convolutional neural network (CNN) algorithms for disaster victim identification (DVI) using dental evidence, with a specific focus on orthopantomograms (OPGs). This work is fully aligned with the mission of COST Action CA22106 – MDVI, which promotes interoperability, data standardisation, and the ethical implementation of digital and AI-based technologies for forensic imaging and individual identification, particularly within Working Group 2 (WG2) on imaging standardisation and digital data integration across forensic disciplines.

Objectives

The main aim of this minor project was to develop and validate AI algorithms based on convolutional neural networks (CNNs) for two specific forensic applications: Age classification – distinguishing between individuals aged 16–23 years and 24–30 years using OPGs; Positive identification – determining whether two OPGs belong to the same individual (“Same”) or to different individuals (“Different”). These

algorithms were designed to serve as decision-support tools for forensic odontologists in DVI scenarios, expediting triage and improving reproducibility while maintaining human interpretive control.

Materials, Methods and Results

A total of 1235 OPGs from 1050 individuals aged 16–30 years were collected from the Stomatology Department of ULS Santa Maria. All radiographs were anonymised and standardised in accordance with institutional ethical approvals and the General Data Protection Regulation (GDPR).

The computational workflow was implemented in Python, using supervised learning and transfer learning with the pre-trained VGG16 architecture, selected for its reliability in medical image analysis. The following experimental designs were applied: Age Classification: a binary classification problem dividing individuals into “16_23” (class 1) and “24_30” (class 0). Training used the RMSprop optimiser (learning rate 0.0001, batch size 8, 200 epochs, 128×128 px image size) with early stopping to prevent overfitting. Positive Identification: a binary task comparing pairs of OPGs. The Adam optimiser (learning rate 0.001, batch size 8, 50 epochs, 214×214 px image size) was used with early stopping and learning-rate reduction on plateau (patience 5, factor 0.2). Class imbalance was addressed through weighting (Positive = 3; Negative = 1). Predictive performance was assessed using accuracy, precision, sensitivity, and F1-score, complemented by loss-function monitoring and cross-validation.

Results

Age Classification

The CNN achieved an overall accuracy of approximately 85 %, with greater sensitivity for the “16_23” class and higher precision for the “24_30” class. Grad-CAM heatmaps confirmed that the network focused on anatomically meaningful regions, including crown-root morphology and apical closure, demonstrating model interpretability and alignment with odontological reasoning. In a DVI context, this algorithm enables the rapid triage of victims according to age intervals, contributing to more efficient organisation of forensic examinations.

Positive Identification

The second model also achieved an accuracy of around 85 %, with superior precision and sensitivity for the “Different” class, meaning the system more reliably excluded non-matching AM–PM pairs.

Although performance was lower for identifying “Same” pairs, the algorithm’s ability to rapidly detect differences provides a valuable exclusion tool during mass-casualty identification efforts. Heatmaps again showed the model’s focus on dental structures used by experts—such as root form, crown shape, and tooth alignment—reinforcing its transparency and forensic relevance. Both models displayed consistent results and reproducibility, with slight overfitting typical of limited datasets. Expansion of training data and balanced sampling will further strengthen generalisation. Nonetheless, the obtained results already demonstrate that CNN-based systems can substantially support human expertise in forensic radiographic interpretation.

Ethical, Legal, and Standardisation Framework

All work was conducted in full compliance with GDPR and the approved ethics protocol. The methodological design followed the principles of responsible AI, emphasising transparency, fairness, and explainability. From a technical and regulatory perspective, the study aligns with the EU Artificial Intelligence Act and with international standardisation activities under ISO/TC 106 Dentistry WG13, in which the author participates. Four main operational pillars supported legal and ethical robustness:

Auditability and traceability of algorithmic outputs; Bias detection and mitigation through dataset balancing; Quantification of uncertainty to express probabilistic results; Human oversight, ensuring expert

odontologists retain interpretive authority. This framework ensures that AI functions strictly as a decision-support mechanism within admissible medico-legal boundaries.

Discussion

The Lisbon presentation underscored that forensic odontology can lead the adoption of explainable and standardised AI tools for human identification. The developed algorithms demonstrate how CNNs can effectively accelerate DVI workflows while preserving the principles of accuracy, reproducibility, and ethical accountability. Beyond their technical contribution, these models mark an important step toward integrating AI-assisted methods into real forensic environments. The work also provides the experimental foundation for ongoing developments under the AIdentifyAGE (FCT 2024.07444.IACDC) initiative, which extends AI applications in forensic dentistry to age assessment, dataset interoperability, and explainability under the European Open Science framework. By combining scientific validation with legal compliance, these studies contribute to strengthening trust in AI-supported forensic evidence and to reinforcing Europe's leadership in ethical forensic innovation.

Conclusions

The algorithms developed and presented within the COST Action CA22106 – MDVI framework demonstrate that artificial intelligence can play a decisive role in forensic identification by comparing antemortem and postmortem OPGs in individuals aged 16–30 years. Both models—the age classification and the positive identification CNNs—achieved consistent performance ($\approx 85\%$ accuracy) and high interpretability through heatmap analysis, confirming that AI can meaningfully assist experts in forensic decision-making. Artificial intelligence must remain a supportive analytical instrument, enhancing diagnostic precision and speed without replacing human judgment. This research, developed with the scientific infrastructure and resources of AIdentifyAGE (FCT Grant 2024.07444.IACDC) and presented under COST Action CA22106 – MDVI, exemplifies how ethically governed, standardised, and explainable AI can contribute to a new era of responsible forensic odontology, where technology serves justice through transparency, reproducibility, and human expertise.

END OF CONFERENCE PROCEEDINGS