Artificial Intelligence in Forensic Odontology

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Dear Readers,

Forensic odontology (FO) is a branch of dentistry that helps with the identification of an individual by assessing the structures of the oral cavity. It mainly concerns medico-legal purposes for the identification of an individual during a mass disaster or accidental remains. Tooth, jawbone, radiographs, lip prints, and palatal rugae are considered as reliable methods for the identification of an individual in FO. In recent times technological advancements have also gained revolution in modern dentistry. These are termed as artificial intelligence models. Such models can be trained and then applied for decision making, problem-solving purposes as well as in dental and medical diagnostics. The major advantage of these models is that they provide reasoning for clinical decision making and have proven to be a breakthrough in providing reliable information in decision making[1].

Applications of Artificial Intelligence in Forensic Odontology

Facial Reconstruction

Forensic facial reconstruction involves recreation of an individual's face of unknown identity from their skeletal remains. Computerized facial reconstruction method uses a laser video camera interfaced with a computer or with CT scanning. Sex determination from skeletal structures is performed by artificial neural networks with 95% accuracy[2]. Artificial intelligence methods will eliminate human bias, without any special expertise and provide rapid results when used for sex estimation of skeletal remains.

Age Estimation

The accuracy of dental age estimation is further improved by several machine learning algorithms. With the advent of artificial intelligence, several programming neural networks can train computers to automatically estimate age.[2-4]

Gender Determination

Artificial neural network when combined with previously used models- discriminant analysis and logistic regression can be replaced by algorithms creating minimal human errors due to automation.

Cheiloscopy

Lip contours and new lip geometrical measurements using a Probabilistic Neural Network for lip based biometric verification serves as a novel biometric in contrast to other methods like the texture of the lip surface giving minimal error.

Bite Marks

AI can give a reasonable matching accuracy by selecting some specific features of the bite marks which are obtained and analysed on a given model. Also, if bite marks are obtained as ante mortem records and stored in a database, they can be matched with post-mortem records via algorithms developed through AI and be a useful source of positive identification[3].

3D Printing

3D printing in forensic odontology is mainly used for sex determination, bite mark analysis, age estimation, cheiloscopy, palatoscopy, facial reconstruction, and tongue print pattern analysis. When AI is combined with 3D printing technologies, it increases the performance of a 3D printer by facilitating automated production and reducing the risk of error.

Personal Identification

Metaheuristic Algorithm system reported an identification percentage of 97.7% when used with Dental Panoramic Radiograph for personal identification of an individual at a crime scene[4].

Artificial Intelligence, therefore, is the best device for digital forensic investigations. Studies have reported that it displays accuracy and precision equivalent to that of trained examiners and have an added advantage of overcoming human errors. AI can be a boon in Forensic Odontology that will enhance the efficacy of the final output. Various algorithmic models, for this purpose, can be formulated and modified so that all the related personnel can contribute to the field of forensic odontology in the best possible manner.

Thank you,
Dr. Smitha T.

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