

Chapter 11

Kinship Verification by Analysing Facial Images to Ensure Human Security


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ABSTRACT

Kinship verification involves determining the relatedness between individuals by analysing their genetic or phenotypic characteristics or traits. The realm of kinship research has garnered substantial attention particularly in computer vision, with broad applications spanning forensic analysis, genealogy exploration, immigration law and more. This chapter introduces a five-stage methodology for kinship verification through facial images, employing Convolutional Neural Networks (CNNs). The process involves dataset acquisition, preprocessing with FaceNet and Res-Net-50, feature extraction, and CNN model development utilizing Inception Resnet V1 and ResNet-50. The proposed model attains a remarkable accuracy exceeding 85% on a substantial dataset, showcasing its efficacy in identifying kinship relations. Thus,

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the proposed work contributes to reshaping the methodology for kin verification, enhancing human surveillance through the development of facial image analysis techniques with immense potential for practical applications.

INTRODUCTION

Kinship verification is the procedure of establishing whether two individuals share a biological relationship and, if confirmed, assessing the degree of closeness in their genetic connection. In forensic science, paternity testing, and genealogy research are very common tasks. The methods that can be used to verify the kinship are genetic testing, facial recognition, and anthropological analysis.

One of the most common methods used for kinship verification is genetic testing. This method involves analysing the DNA of both individuals to determine if they share common genetic traits. The degree of relatedness can be estimated based on the number of traits they have in common.

Another method used for kinship verification is facial recognition. This method uses the facial features of two individuals are compared to determine if they share any common traits. It is a method in which photographs or other images of individuals are used for analysis.

The third method used for kinship verification is anthropological analysis. In this method, the physical characteristics of two individuals are used to determine if they share any common traits. This is a method which is used for skeletal remains, as it can provide valuable information about the age, gender, and ancestry of the individuals being studied.

Overall, kinship verification is a complex process that requires a combination of scientific methods and expert analysis to determine the degree of relatedness between two individuals. The selection of a method for kinship verification is contingent upon the particular circumstances of the case, along with the resources and expertise accessible to the researchers engaged in the process.

Significance and Applications of Kinship Verification

Kinship Verification finds diverse applications across crucial domains. Firstly, in immigration, it serves as a pivotal tool to authenticate relationships between sponsors and beneficiaries, thwarting fraudulent entry attempts into a country. Secondly, it aids in cases like locating missing children, resolving child adoption queries, custody disputes, and validating inheritance claims, ensuring clarity on biological or legal ties. Thirdly, its role in medical research is significant, delving into genetic diseases and curbing their transmission across generations. Moreover,

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