



## Online Person Identification based on Multitask Learning

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**Abstract:** In the digital world, everything is digitized and data are generated consecutively over the times. To deal with this situation, incremental learning plays an important role. One of the important applications that needs an incremental learning is person identification. On the other hand, password and code are no longer the only way to prevent the unauthorized person to access the information and it tends to be forgotten. Therefore, biometric characteristics system is introduced to solve the problems. However, recognition based on single biometric may not be effective, thus, multitask learning is needed. To solve the problems, incremental learning is applied for person identification based on multitask learning. Considering that the complete data is not possible to be collected at one time, online learning is adopted to update the system accordingly. Linear Discriminant Analysis (LDA) is used to create a feature space while Incremental LDA (ILDA) is adopted to update LDA. Through multitask learning, not only human faces are trained, but fingerprint images are trained in order to improve the performance. The performance of the system is evaluated by using 50 datasets which includes both male and female datasets. Experimental results demonstrate that the learning time of ILDA is faster than LDA. Apart from that, the learning accuracies are evaluated by using K-Nearest Neighbor (KNN) and achieve more than 80% for most of the simulation results. In the future, the system is suggested to be improved by using better sensor for all the biometrics. Other than that, incremental feature extraction is improved to deal with some other online learning problems.

**Keywords:** Feature extraction, biometrics, Linear Discriminant Analysis (LDA), incremental learning, multitask learning, person identification

### 1. Introduction

In the era of globalization, life has become convenient when people are using modern technologies such as smart phones, computers and others to do various activities. Online financial transactions, cashless payment and smart home systems are some of the applications resulted from the technology advancement [1-6]. These technologies continuously produce large data stream [7]. Traditional approaches are not able to deal with this condition effectively in terms of performance and accuracy. Therefore, it is very important to have a method that can handle the data whenever data are available. This kind of learning is called "Online" or "Incremental Learning" [8-9]. Incremental learning is very important in many applications considering that the data are not always available at the early stage [10-14]. One of the important applications is person identification because the faces could be changed due to aging, lighting, make up and etc.

Person identification can be easily hacked if the security is not strong enough. Thus, security become a top concern. Most of the conventional person identification are using password-based security where forces user to

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