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***Abstract*— In this paper, a novel method is proposed for Facial Expression Recognition (FER) using dictionary learning to learn both identity and expression dictionaries simultaneously. Accordingly, an automatic and comprehensive feature extraction method is proposed. The proposed method accommodates real-valued scores to a probability of what percent of the given Facial Expression (FE) is present in the input image. To this end, a dual dictionary learning method is proposed to learn both regression and feature dictionaries for FER. Then, two regression classification methods are proposed using a regression model formulated based on dictionary learning and two known classification methods including Sparse Representation Classification (SRC) and Collaborative Representation Classification (CRC). Convincing results are acquired for FER on the CK+, CK, MMI and JAFFE image databases compared to several state-of-the-arts. Also, promising results are obtained from evaluating the proposed method for generalization on other databases. The proposed method not only demonstrates excellent performance by obtaining high accuracy on all four databases but also outperforms other state-of-the-art approaches.**

***Key Words:* Facial Expression Recognition, Dual Dictionary Learning, Sparse Representation, Regression Classification.**

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1. Introduction

Person-independent Facial Expression Recognition (FER) is one of the most difficult and challenging task in computer vision due to unknown changes in the expression of human faces [12]. Automatic FER has various significant applications, for instance, visual observation, intelligent user interface, human-computer interaction, and so on. Also, FER from static images is a more challenging problem than from dynamic images because less information for expression actions is available [12]. Nonetheless, information in a single or static image is sometimes adequate and also useful for FER.

Available FER methods can be mostly categorized into two separate types based on how to utilize the classification schemes. A visual illustration of two types of FER including binary and regression classifications [23, 40, 43] are given in Fig. 1 as