Face recognition has developed into a major research area in pattern recognition and computer vision. Face recognition is different from classical pattern-recognition problems such as character recognition. In classical pattern recognition, there are relatively few classes, and many samples per class. With many samples per class, algorithms can classify samples not previously seen by interpolating among the training samples. On the other hand, in face recognition, there are many individuals (classes), and only a few images (samples) per person, and algorithms must recognize faces by extrapolating from the training samples. In numerous applications there can be only one training sample (image) of each person.

Support vector machines (SVMs) are formulated to solve a classical two class pattern recognition problem. We adapt SVM to face recognition by modifying the interpretation of the output of a SVM classifier and devising a representation of facial images that is concordant with a two-class problem. Traditional SVM returns a binary value, the class of the object. To train our SVM algorithm, we formulate the problem in a difference space, which explicitly captures the dissimilarities between two facial images. This is a departure from traditional face space or view-based approaches, which encodes each facial image as a separate view of a face.

In difference space, we are interested in the following two classes: the dissimilarities between images of the same individual, and dissimilarities between images of different people. These two classes are the input to a SVM algorithm. A SVM algorithm generates a decision surface separating the two classes. For face recognition, we re-interpret the decision surface to produce a similarity metric between two facial images. This allows us to construct face-recognition algorithms.