# Term Project

**BENI-SUEF UNIVERSITY,**

**FACULTY OF COMPUTERS AND INFORMATION,**

**PATTERN RECOGNITION**

## Team Members:-

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## Paper Title:

# Recognition of Handwritten Digits Using Machine Learning Techniques

# Optical Recognition of Handwritten Digits Dataset

**Data Set Characteristics:**

1. Number of Instances: 1797.
2. Number of Attributes: 64.
3. Attribute Information: 8x8 image of integer pixels in the range 0:9.
4. Missing Attribute Values: None.
5. Creator: E. Alpaydin (alpaydin '@' boun.edu.tr).
6. Date: July; 1998.

**Link:**

- http://archive.ics.uci.edu/ml/datasets/Optical+Recognition+of+Handwritten+Digits.

**Information about Dataset:**

1. Pre-processing programs made available by NIST were used to extract normalized bitmaps of handwritten digits from a pre-printed form.
2. From a total of 43 people, 30 contributed to the training set and different 13 to the test set.
3. 32x32 bitmaps are divided into no overlapping blocks of 4x4 and the number of on pixels is counted in each block.
4. This generates an input matrix of 8x8 where each element is an integer in the range 0:9.
5. This reduces dimensionality and gives invariance to small distortions.
6. For info on NIST pre-processing routines, see [1].

**Reference:**

1. M. D. Garris, J. L. Blue, G.T. Candela, D. L. Dimmick, J. Geist, P. J. Grother, S. A. Janet, and C.L. Wilson, NIST Form-Based Handprint Recognition System, NISTIR 5469,1994.

2. C. Kaynak (1995) Methods of Combining Multiple Classifiers and Their Applications to Handwritten Digit Recognition, MSc Thesis, Institute of Graduate Studies in Science and Engineering, Bogazici University.

3. E. Alpaydin, C. Kaynak (1998) Cascading Classifiers, Kybernetika.

4. Ken Tang and Ponnuthurai N. Suganthan and Xi Yao and A. Kai Qin. Linear dimensionality reductionusing relevance weighted LDA. School of Electrical and Electronic Engineering Nanyang Technological University. 2005.

5. Claudio Gentile. A New Approximate Maximal Margin Classification Algorithm. NIPS. 2000.