Introduction of Pattern Recognition with various Approaches

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ABSTRACT : The objective of this paper is To Familiarize with the fundamental concepts of pattern recognition (PR) & discusses various approaches for same. This paper deals issues: definition of PR (Pattern recognition), PR as System, approaches for PR.
Keywords: About five key words in alphabetical order, separated by comma.

I. INTRODUCTION

In machine learning, PR(**pattern recognition)** is the assignment of a label to a given input value. An example of pattern recognition is classification, which attempts to assign each input value to one of a given set of classes.

Pattern recognition generally aim to provide a reasonable answer for all possible inputs and to perform "most likely" matching of the inputs, taking into account their statistical variation. This is opposed to pattern matching, which look for exact matches in the input with pre-existing patterns.
Our goal is to discuss and compare pattern recognition as the best possible Way.

II. DEFINITION

Before we define PR, we see what is mean by **Pattern** is a term with pair comprising an observation & a meaning.So
PR as per "It is a process of taking raw data & performing action based on the "category" of the pattern."
Or

Assignments of inputs to classes.
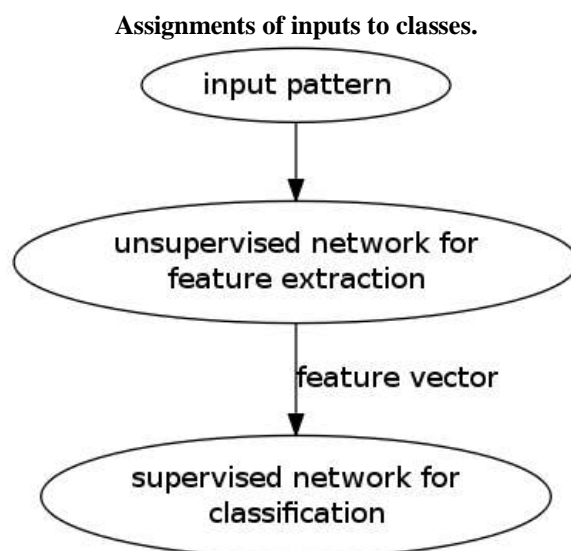
Classification of PR is based on the following two:
1)   Supervised classification:

Here the input pattern is identified as a member of a pre- defined class.
2)   Unsupervised classification:

Here the pattern is as.
3)   PR as System:

A pattern recognition system (PRS) is an automatic system that aims at classifying the input pattern into a specific class. It proceeds into two successive tasks:

1) The analysis (or description) that extracts the characteristics from the pattern being studied i.e. data acquisition and preprocessing and

2) The classification (or recognition) that enables us to recognize an object (or a pattern) by using some characteristics derived from the first task .i.e. data representation, and decision making. The problem domain dictates the choice of sensor(s), preprocessing technique, representation scheme, and the decision making model.

The classification scheme is usually based on the availability of the training set that is a set of patterns already having been classified. This learning strategy is termed as supervised learning in opposition to the unsupervised learning. A learning strategy is said to be unsupervised if for the system is not given an a priori information about classes; it establishes the classes itself based on the regularities of the features. Features are those measurements which are extracted from a pattern to represent it in the features space. In other words, pattern analysis enables us to use some features to describe and represent it instead of using the pattern itself.

4) Approaches for PR:

The four best known approaches for pattern recognition are:
1) Template matching,
2) Statistical classification,
3) Syntactic or structural matching, and
4) Neural networks.
1. Template Matching:

This is one of the simplest and earliest approaches to pattern recognition is based on template matching. Matching is a generic operation in pattern recognition which is used to determine the similarity between two entities of the same type.

It is widely used in image processing to localize and identify shapes in an image. In this approach, one looks for parts in an image which match a template (or model). In visual pattern recognition, one compares the template function to the input image by maximizing the spatial cross-correlation or by minimizing a distance: that provides the matching rate.

Fig .1 illustrate a pattern recognition based on the template matching approach. Fig .1.a is the input image I, Fig.1.b represents two templates (K representing letter 'K' and P letter 'P').
Input: pixels output: as correlation, distance measure function.

III. STATISTICAL CLASSIFICATION :
In this approach, each pattern is represented in terms of d features or measurements and is viewed as a point in a d- dimensional space. The goal is to choose those features that allow pattern vectors belonging to different categories to occupy compact and disjoint regions in a d-dimensional feature space.
Typically, these are based on statistics and probabilities. In these systems, features are converted to numbers which are placed into a vector to represent the pattern. This approach is most intensively used in practice because it is the simplest to handle.
Number of segments   4
Number of horizontal segments: 2
Number of vertical segments   2
Number of diagonal segments   0

A. Fig.2. Illustrate a pattern recognition based on the Statistical.

Input: Features output: as discriminate function.
2.   Syntactic or structural matching:
In this approach , systems are based on the relation between features. In this approach, patterns are represented by structures which can take into account more complex relations between features than numerical feature vectors used in statistical PRSs (Venguerov & Cunningham, 1998). Patterns are described in hierarchical structure composed of sub-structures composed themselves of smaller sub-structures.
Given the code words on the left of figure, the shape on the right of the figure can be represented as the following string S, when starting from the pointed codeword on the figure:
S = d b a b c b a b d b a b c b a b
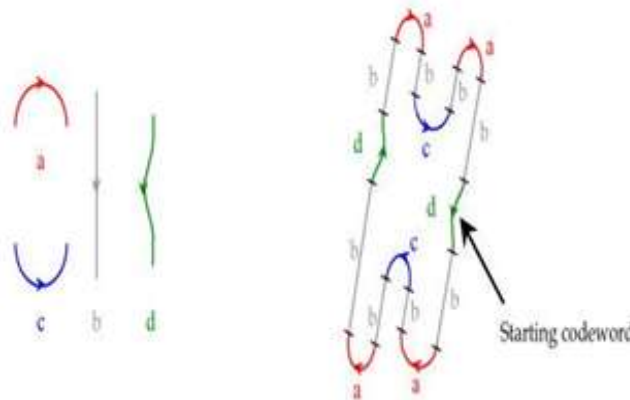
A. Fig.3. Illustrate a pattern recognition based on the Syntactic or structural matching**.**
Input: primitives output: as Roles, grammar function

Neural networks:
Typically, an artificial neural network (ANN) is a self- adaptive trainable process that is able to learn to resolve complex problems based on available knowledge. A set of available data is supplied to the system so that it finds the most adapted function among an allowed class of functions that matches the input.

Besides these approaches, one can encounter other methodologies like those based on fuzzy- set theoretic, genetic algorithms. In some applications, hybrid methodologies combine different aspects of these approaches to design more complex PRSs. In (Liu et al., 2006), the authors present an overview of pattern recognition approaches and the classification of their associated applications.
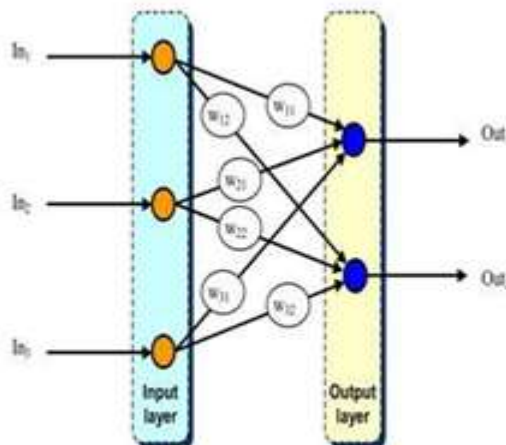

Fig.4. Illustrate a pattern recognition based on the Neural networks.

Input: pixels, samples output: as Network function.

IV. CONCLUSIONS

It is the goal that most parts of the paper can be appreciated by a new comer to the field of pattern recognition based on the above discussion and can easily understand the basic concept of pattern recognition.

REFERENCES

[1]. Abdi, H. (1994). A neural network primer. Journal of Biological Systems, Vol. 2, No. 3, pp. 247-281.

[2]. Belongie, S., Malik, J., and Puzicha, J., Shape matching and object recognition using shape contexts. IEEE PAMI-24, No 24, pp 509-522, 2002

[3]. Bober, M. (2001). MPEG-7 Visual Shape Descriptors, IEEE Transactions on Circuits and Systems for Video Technology, Vol. 11, No. 6, pp 716-718.

[4]. Bruckstein, A. M., Rivlin, E., and Weiss, I. (1996). Recognizing objects using scale space local invariants, Proceedings of the 1996 International Conference on Pattern Recognition (ICPR '96), August 25-29, pp.

[5]. 760-764, Vienna, Austria.

[6]. Bruckstein, A., Katzir, N., Lindenbaum, M., and Porat, M. (1992). Similarity invariant signatures for partially occluded planar shapes, IJCV, Vol. 7, No. 3, pp. 271-285.

[7]. Brunelli, R. and Poggio, T. (1997). Template Matching: Matched Spatial Filters And Beyond, Pattern Recognition, Vol. 30, No 5, pp. 751-768

[8]. Chaumette, F. (2004), Image   Moments: A General and Useful Set of Features for Visual Servoing, IEEE Transactions on Robotics, Vol. 20, No. 4, pp. 713-723

[9]. Chaumette, F. (1994). Visual servoing using image features defined upon geometrical primitives, International 33rd IEEE Conference on Decision and Control, Vol. 4, pp. 3782- 3787, Orlando, Florida

[10]. Cole, L.; Austin, D. and Cole, L. (2004). Visual Object Recognition using Template Matching, Australasian Conference on Robotics and Automation 2004

[11]. Coster, M. and Chermant, J.-L. (1985). Précis d'Analyse d'Images, Editions du CNRS, 15, quai A. France, Paris, 1985

[12]. Frawley, W. J.; Piatetsky-Shapiro, G.   & Matheus, C. J. (1992). Knowledge Discovery in Databases: An Overview, AI Magazine 13(3), pp. 57-70

[13]. Grigorescu, C., and Petkov, N. (2003). Distance Sets for Shape Filters and Shape Recognition. IEEE Trans. Image Processing 12(9).

[14]. Haralick, R.M. (1979), Statistical and structural approaches to texture, Proceedings of the IEEE, No. 5, Vol. 67, pp. 786-804

[15]. Kidiyo Kpalma and Joseph Ronsin 'An Overview of Advances of Pattern Recognition Systems in Computer Vision' IETR (Institut d'Electronique et de Télécommunications de Rennes) UMR – CNRS 6164 Groupe Image et Télédétection Institut National des Sciences Appliquées (INSA) de Rennes.

[16]. R. Picard, Affective Computing. MIT Press, 1997

[17]. P.E. Ross, "Flash of Genius," Forbes, pp. 98- 104, Nov. 1998

[18]. S.Watanabe, Pattern Recognition: Human and Mechanical New York: Wiley, 1985

[19]. J. Anderson, A. Pellionisz, and E. Rosenfeld, Neurocomputing 2: Directions for Research.

[20]. Cambridge Mass.: MIT Press, 1990

[21]. R. Bajcsy and S. Kovacic, "Multiresolution Elastic Matching, Computer Vision Graphics Image Processing," vol. 46, pp. 1-21, 1989 .

[22]. L. Devroye, L. Gyorfi, and G. Lugosi, A ProbabilisticTheory of Pattern Recognition. Berlin: Springer-Verlag, 1996 .

[23]. R.O. Duda and P.E. Hart, Pattern Classification andScene Analysis, New York: John Wiley & Sons, 1973

[24]. K.S. Fu, Syntactic Pattern Recognition and Applications. Englewood Cliffs, N.J.: Prentice- Hall, 1982.

[25]. A.K. Jain, J. Mao, and K.M. Mohiuddin, "ArtificialNeural Networks: A Tutorial," Computer, pp. 31-44, Mar. 1996

[26]. T. Kohonen, Self-Organizing Maps. Springer Series in In-formation Sciences, vol. 30, Berlin, 1995 T. Pavlidis, Structural Pattern Recognition. New York: Springer-Verlag, 1977

[27]. L.I. Perlovsky, "Conundrum of Combinatorial Complexity," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 20, no. 6, pp. 666-670, 1998

[28]. B. Ripley, "Statistical Aspects of Neural Networks," Networks on Chaos: Statistical and Probabilistic

Aspects. U. Bornndorff-Nielsen, J.Jensen, and W. Kendal, eds., Chapman and Hall, 1993

[29]. V.N.Vapnik, Statistical Learning Theory. New Work John Willy & Sons,1998

[30]. Vinita Dutt*, Vikas Chadhury, Imran Khan 'Different Approaches in Pattern Recognition' Computer Science and Engineering. 2011; 1(2):32-35 DOI:

[31]. 10.5923/j.computer.20110102.06.