This paper describes three mathematical modeling techniques viz. Multi Dimensional Scaling (MDS), Gabriel Graph and Fuzzy Clustering for pattern recognition. This is a novel approach for the analysis of geomagnetic data. Validity of the techniques for geomagnetism has been established by the author through his publications in geophysical journals. The aim of the paper is to explain the step by step procedure of the analytic techniques for easy understanding of the data analysts even to a non specialist in mathematics.

Multi Dimensional Scaling which is complementary to factor analysis. In statistics individual measurements are lost sight of in favor of estimated means and variances of samples of population whereas in the present approach the identity of each point and each observation vector and its relationship to all other points are preserved and are central to the analysis.

Gabriel Graph is a graph theoretical model complementary to classical principal component analysis, curvilinear component analysis, self organizing maps, projection techniques and cluster analysis.

Fuzzy Clustering provides compactness and separation validity more accurately in a group of data. Numerical values in the proximity matrix are only quantitatively descriptive numbers whose significance cannot be evaluated by conventional statistical techniques and should be determined subjectively.

Exploratory data analysis is an important and active field of research, which aims to deal with exponential growth of high dimensional data bases in many domains. The three techniques are explained using a single data table enabling researchers to write the software according to their necessities.