

Visualization of Positive Semi Definite Matrices

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This paper studies on how to identify positive semi definite property of a matrix using a plot. The main difference of positive semi definite matrix and negative semi definite matrix is defined by eigen values. All the eigen values of positive semi definite matrix are non-negative. All the eigen values of negative semi definite matrix are non-positive. This study will help to determine positive semi definite property of a matrix without using matrix calculations and in this research paper, we use positive semi definite matrix, negative semi definite matrix, square and symmetric matrix, non symmetric matrix and non square matrix. 10 by 10 matrices were used for the study except non square matrix. Contour plot was used as a visualization tool. Because of the features of the contour plot, the positive semi definite property of a matrix was identified. The main difference between the contour plot of positive semi definite matrix and contour plot of negative semi definite matrix is location of contour centers. If contour plot represents positive semi definite matrix, then contour centers are all over graph. If contour plot represents negative semi definite matrix, then contour centers lie only in the diagonal. Symmetric property was implied by dividing the contour plot into two equal parts through a line along in the diagonal. If X and Y axis have same ranges in the contour plot, then the contour plot represents square matrix. Therefore, the symmetric property and the square property of matrices were identified from contour plot. If contour centers are all over graph in a contour plot of symmetric and square matrix, then the contour plot represents positive semi definite matrix. We can identify positive semi definite property, symmetric property and square property using contour plot.

Keywords: Eigen Values, Positive Semi Definite, Negative Semi Definite, Covariance, Contour Plot

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