Machine Learning Math

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| **Name** | **Formula** | **Notes** |
| L2 - Euclidian Distance (Norm Distance) |  | Sqrt of difference squared |
| L1 - Max Distance |  | Sum of the absolute values |
| – Infinite Distance |  | Maximum of the absolute values (singular biggest of the set of diffs) |
|  |  | Sum of absolute values |
|  |  | Sqrt of summed Squares |
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| Angle Between Vectors |  | 1. Top: Dot product of two vectors 2. Bottom: Calculate the length of each vector, or L2 norm (magnitude) & multiply the lengths 3. Calculate the arc-cosine of the resulting quotient to get the degree |
| Bayes Rule |  |  |
| Dot Product of a Vector |  | Multiply Matching Members and then Sum |
| Dot Product of a Matrix |  | 1. We match the 1st members (1 and 7), multiply them, likewise for the 2nd members (2 and 9) and the 3rd members (3 and 11), and finally sum them up. 2. We can do the same thing for the 2nd row and 1st column: |
| Dot Product a Matrix & a Vector |  |  |
| Determinant of a Matrix |  | 1. You can only have a determinant of a square matrix |
| Singular Matrix |  | 1. A matrix is singular IFF the determinant is 0 2. There is no inverse when it is 0 |
| Mean Squared Error (MSE) |  | Note: This is the same formula for variance of two numbers. Actual – Expected Squared (s = expected) |
| Absolute Error |  | Similar to MSE but without the sqare. Use absolute values to avoid negatives. |
| Parameterized Line for Single Variable |  | a = slope, b = intercept |
| Line Fitting Loss Function |  | x = predictor, y = response (the two axes you’re comparing on the scatterplot) |
| Optimal setting for ***b*** (*derivative of b*) |  | *mean* Y value (response) – a \* *mean* X Value (predictor) |
| Optimal setting for ***a*** (*derivative of a*) |  | Covariance / Variance |
| Parameterized Line with Multiple Variables | *--or--* | Note: Used to calculate the distance to a decision boundary, positive or negative = classification |
| Least Squares Regression |  |  |
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