Assignment 3
ME 781
(dissimilarity/similarity measure and testing)

1. Create a Python function/subroutine to calculate the dissimilarity and similarity between two data points.

a. It should take 2 data points and a dissimilarity/similarity measure as inputs (and any additional data needed for calculation) and return both the dissimilarity and similarity between the data points based on that.

- Parameters:
  - Data Point 1: 1D array of data type float or int
  - Data Point 2: 1D array of data type float or int
  - Measure: String (abbreviation for the dissimilarity/similarity measure as given in Table 1)
  - (Optional) Additional data: Any additional data required by the dissimilarity/similarity measure
- Returns:
  - Dissimilarity and Similarity between the data points: 2-tuple (Float, Float)
  - Just for uniformity in the submissions, return (dissimilarity, similarity)

PS: Any dissimilarity measure can be used to define a corresponding similarity measure and vice versa.

b. The subroutine should be robust to wrong inputs

- If any of the 3 (or 4) arguments are not in the expected format, then it should be able to detect it and print an appropriate message on the debug console.
- It should not crash under any circumstances, as long as we pass it 3 (or 4) arguments.
- Basically, for any arguments, it should either return the 2-tuple (dissimilarity, similarity) or it should give an appropriate reason for not being able to compute it.

Submission guidelines: Submit a single .ipynb file containing all the required functions.

Table 1: Dissimilarity/ Similarity Measures

Dissimilarity/Similarity Measure	Abbreviation	Additional data
Euclidean norm	EN	None
Frobenius or Hilbert Schmidt norm	HSN	None
Diagonal norm	DN	Diagonal matrix data (a vector)
Mahalanobis norm	MN	All “n” data points for computing covariance matrix
Lebesgue or Minkowski norm	LMN	Alpha value
Cosine	CS	None
Overlap	OS	None
Dice	DS	None
Jaccard	JS	None

P.S.: In the slides, all vectors are row vectors not column vectors. For calculating the covariance matrix in Mahalanobis norm, use p (distribution dimension) mutually independent data points in order to ensure that covariance matrix is not singular.