Nonmetric MDS Assignment

2/16/06

Part A:

Construction of a Spatial Configuration of Four Points From a Rank Order of Their Six Interpoint Distances

⇒ intro to nonmetric MDS

1. See if you can arrange four points, A, B, C, D, on a straight line in such a way that

   AB < CD < BC < AC < BD < AD

   (where AB denotes the *distance* between A and B, etc.)

2. See if you can arrange the four points on a straight line in such a way that

   AB < CD < BC < BD < AC < AD

   (Note: In both of these cases give a picture of your solution or else state why such a solution cannot be obtained. Also, notice that the only difference between the two rank orders is that AC and BD are interchanged; i.e., both orders have the form AB < CD < BC < ... < AD.)

3. Now consider the second set of inequalities given in 2, above. Can this set be satisfied if the four points are no longer required to fall on a straight line? As before, give a picture of a solution (this time in the two-dimensional plane, rather than on a straight line) or else give a reason why such a solution cannot be obtained.

Part B: NONMETRIC MDS (KRUSKAL'S LEAST-SQUARES MONOTONIC TRANSFORM)

Here is the dissimilarity data for the digits data (note we could also start from the orisinal (symmetrized) confusions for nonmetric mds):

	1	2	3	4
2	875			
3	800	600		
4	125	850	925	
5	890	670	675	890

Here are the coordinates for the 2-dimensional solution:

	d 1	d 2
1	.914	-.229
2	-.660	-.078
3	-.649	-.648
4	.923	.172
5	-.589	.716

1) Calculate the derived model distances between each pair of stimuli using the above coordinates (use the Euclidean distance metric).

2) Re-order these model distances according to the order of the proximity data, and find the least-squares monotonic transform of the dissimilarities.

3) Calculate stress 1 for this configuration.