
The linear algebra of Pandora and the Music Genome Project

OBJECTIVES

1. Use MATLAB to compute distances and angles between vectors in \mathbf{R}^n for large n .
2. Apply geometric concepts to solve practical problems.
3. Write a technical abstract describing the basic mathematics of the Music Genome Project and Pandora Internet Radio.

INSTRUCTIONS

1. Write down 5 of your favorite songs.
2. Brainstorm with class members to create an ordered list of musical characteristics that describe your songs. Examples could include: tempo, Hip-Hop influence, acoustic, etc.
3. Assign to each of your chosen songs, a vector of length 10 corresponding to the musical characteristic list you just created. The components of this vector are integers in the range 0-5, with 0 meaning none of, and 5 meaning very much of the corresponding musical characteristic.
4. Arrange your 5 vectors into a matrix and bring this matrix to the next class. The columns of the matrix should correspond to songs, so your matrix will be a 10 (rows) by 5 (columns) matrix.
5. See below for a description of the genome vector for our class.

The vector we decided upon in class is as follows has components in this order:

1. Acoustic (= 0) vs. Electric (= 5)
2. Rock Influence
3. Does the song vary in dynamics, does the mood change, etc. (0 = no, 5 = YES!)
4. What is the instrument to vocal ratio? (0 = mostly instrumental, 5 = mostly vocal)
5. Vocal Speed (0 = slow, 5 = fast)
6. Rhythm Speed (0 = slow, 5 = fast)
7. Bass vs. Treble (0 = lots of low tones), (5 = lots of high tones)
8. Key Changes (0 = classic three chord pop, folk and country songs, 5 = intricate jazz compositions)
9. Music people tend to party to (0 = "Let's Dance", 5 = "My dog died")
10. Profanity (0 = no profane lyrics, 5 = extremely profane)