Math 420, Spring 2019
Second Team Homework

due Tuesday, 26 February, 2019

Consider the dataset assigned to this homework: files 'AlignmentData_XFile.txt' and 'AlignmentData_YFile.txt'. Both files contain two sets of points, each consisting of n points in d dimensions. These points define $d \times n$ matrices X and Y respectively. The files have the following format (this is for file 'AlignmentData_XFile.txt'; similar for the file ending in '...YFile.txt'):

First line: n d

Second line: X(1,1) X(2,1) ... X(d,1)

...

$(n+1)^{st}$ line: X(1,n) X(2,n) ... X(d,n)

This homework asks you to implement the Full Alignment algorithm, compute the optimal alignment parameters $Q \in O(d)$, $z \in \mathbb{R}^d$ and $a > 0$ that minimize

$$(\hat{Q}, \hat{z}, \hat{a}) = argmin_{Q \in O(d), z \in \mathbb{R}^d, a>0} J(Q, z, a) \ , \ J(Q, z, a) = \|Y - aQ(X - z1^T)\|_F^2$$

and print the approximation error, that is $J(\hat{Q}, \hat{z}, \hat{a})$.

For this write a Matlab code that:

1. Loads the two data files assigned to this homework;
2. Implements the Full Alignment algorithm to estimate $\hat{Q}, \hat{z}, \hat{a}$, the optimizer of the alignment error;
3. Computes the approximation error $J(\hat{Q}, \hat{z}, \hat{a})$;
4. Prints out the results (parameters and error).

Submit the code as well as the printout of the results.