

ISC 4220
Continuous Algorithms
Least Squares Approximation

1-) Given these equations, use linear least squares to rank the 4 teams:

Results:

$r =$

5.2500
4.6250
9.1250
1.0000

Using the code above, we can determine that the teams are ranked as follows:
Team 3 is 1st, Team 1 is 2nd, Team 2 is 3rd, Team 4 is 4th.

2-)

(i) The coefficients a_1 and b_1 in model $m_1(x)$ can be determined by linear least-squares.
Find a_1 and b_1 .

$a_1 = 15.2747$, $b_1 = 0.0426373365$

(ii) The coefficients a_2 and b_2 in model $m_2(x)$ cannot be determined by linear least-squares.
Let us consider the following cost function:

Evaluate the gradient:

The gradient of $f = a_2x + 2 \exp(b_2x)$ is :
 $\text{gradient} = [x ; 2x \cdot e^{(b_2x)}]$

(iii) Use the BFGS method to find the a_2 and b_2 that minimizes $\Phi(a_2, b_2)$. Use an initial guess of $[a_2, b_2]^T = [-1, 1]$, and a tolerance of 10^{-4} on the norm of the gradient. Report the following:

(please give feedback to my BFGS code attached, i couldn't get it to work properly)

(a) first two iterations
1st:

$x =$

-1

1

f =

2.3181

n =

0

2nd: NA

(b) the converged solution,

x =

-1

1

(c) the norm of the gradient at the solution.

[0 ,0]