1. Probability Review

   There are n archers all shooting at the same target (bullseye) of radius 1. Let the score for a particular archer be defined to be the distance away from the center (the lower the score the better, and 0 is the optimal score). Each archer's score is independent of the others, and is distributed uniformly between 0 and 1. What is the expected value of the worst (highest) score?

2. Maximum Likelihood Estimation

   Given N i.i.d. Poisson random variables, $x_1, x_2, ..., x_N$, find the maximum likelihood estimator for the parameter of the distribution, λ. Recall for a Poisson R.V., $p(x; \lambda) = \frac{e^{-\lambda}\lambda^x}{x!}$.

3. Linear Algebra

   Find the eigenvalues and corresponding eigenvectors of the following matrix.

$$A = \begin{bmatrix} 2 & 1 \\ 0 & -1 \end{bmatrix}$$

4. Projections

   Given a plane $x + y + z = 4$ and point A located at $(2, 6, 8)$, find the coordinates of the closest point B on the plane to A. What is the distance between A and B?