

Problem 2: optimization and non-negative decomposition

i. Computing a Derivative

$$E = \frac{1}{DT} \|M - NW\|^2 = \frac{1}{DT} (M^T - W^T N^T)(M - NW)$$

$$= \frac{1}{DT} (M^T M - W^T N^T M - M^T N W + W^T N^T N W)$$

The derivative of W is

$$\frac{dE}{dW} = \frac{2}{DT} N^T (NW - M)$$

ii. A Non-Negative Projection

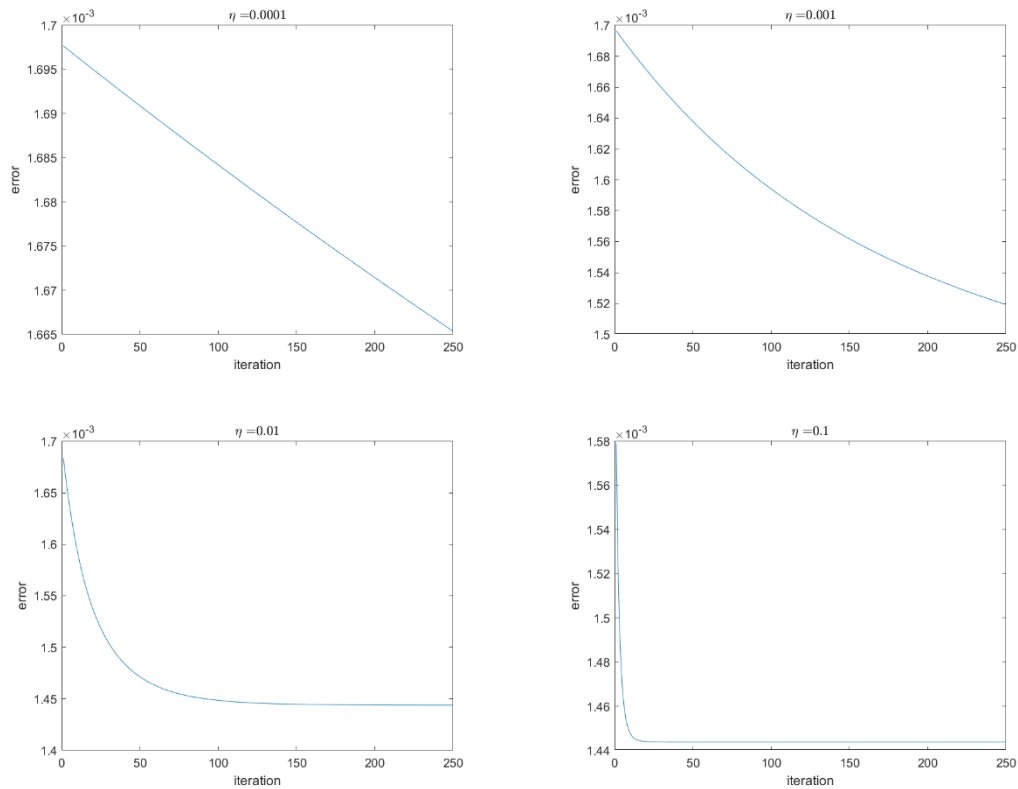


Figure 1 The Error Plot with Different η

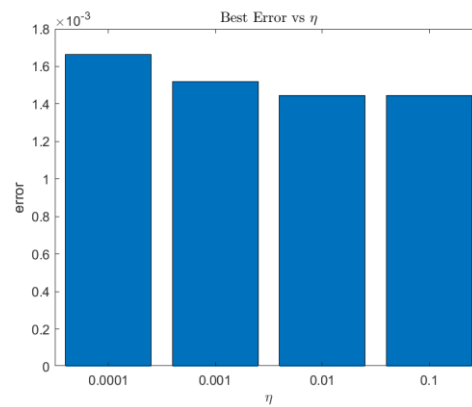


Figure 2 Best Error with Different η