Assignment 5

Your result shows that the line we are looking for passes through the arithmetic mean $\mathbf{c}$ of the vector set $\{\mathbf{a}_1, \ldots, \mathbf{a}_m\}$. Now we can plug $\mathbf{c} - \mathbf{x}\left(\mathbf{c}^T\mathbf{x}\right)$ for $\mathbf{y}$ in

$$\min_{\mathbf{x},\mathbf{y}} \left\{ \sum_{i=1}^{m} |\mathbf{a}_i - \mathbf{y}|^2 - \left|\mathbf{x}^T\mathbf{a}_i\right|^2 \text{ subject to } \mathbf{x}^T\mathbf{x} = 1,\ \mathbf{x}^T\mathbf{y} = 0 \right\}. \tag{1}$$

1. Plug $\mathbf{c} - \mathbf{x}\left(\mathbf{c}^T\mathbf{x}\right)$ for $\mathbf{y}$ in (1) and derive the resulting minimization problem.

2. Solve the minimization problem in (1) above.