Assignment 4

1. Assignment 3, Problem 2.

   You came up with the expression $|\mathbf{a}-\mathbf{y}|^2 - \left|\mathbf{x}^T\mathbf{a}\right|^2$. To identify the least squared approximation line (see Assignment 2, item 2) we would need to solve the following problem

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

   (see Assignment 3, formula 2). The expression involves two unknown $\mathbf{x}$ and $\mathbf{y}$ and they are related ($\mathbf{x}^T\mathbf{y} = 0$). We assume first that $\mathbf{x}$ with $|\mathbf{x}| = 1$ is known, and will try to identify $\mathbf{y}$ so that

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

   (if $\mathbf{x}$ is known, then $\sum_{i=1}^{m} \left|\mathbf{x}^T\mathbf{a}_i\right|^2$ is just a constant). This is **Assignment 4, Problem 1**.