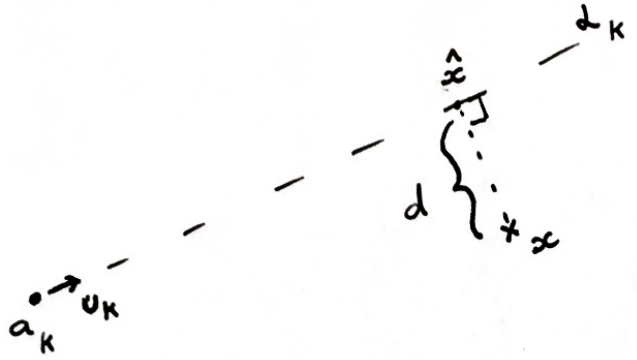
Task 5



Note:

- $d_K = a_K + p u_K$
- $\| u_K \| = 1$
- $p \in \mathbb{R}$

1) The distance between point x and the line d is given by:

$$d = \| x - \hat{x} \|$$

where $\hat{x}$ is the projection of x in d

2) Notice that

$$\hat{x} = \frac{u_K u_K^T}{u_K^T u_K} (x - a_K) + a_K = u_K u_K^T x + (I - u_K u_K^T) a_K$$

$\frac{u_K u_K^T}{u_K^T u_K}$ ⇒ Linear algebra property

$u_K^T u_K = 1$, because $\| u_K \| = 1$

3) Therefore

$$d = \| x - \hat{x} \| = \| x - u_K u_K^T x - (I - u_K u_K^T) a_K \| =$$

$$= \| (I - u_K u_K^T)(x - a_K) \|$$