Solution:

We can massage the objective function (left's call if $f_0(u)$ in this way:

$$
\begin{aligned}
f_0(u) &= \frac{1}{n}\sum_{i=1}^{n}\left(u^T x_i - u^T \hat{x}\right)^2 \\
&= \frac{1}{n}\sum_{i=1}^{n}\left((x_i - \hat{x})^T u\right)^2 \\
&= \frac{1}{n}\sum_{i=1}^{n}(u^T(x_i - \hat{x}))((x_i - \hat{x})^T u) \\
&= u^T\left(\frac{1}{n}\sum_{i=1}^{n}(x_i - \hat{x})(x_i - \hat{x})^T\right)u \\
&= u^T \Sigma u
\end{aligned}
$$