Least Squares (Leftovers)

Total Least Squares regression: elliptical geometry (on board)

Eigenvectors / Principal Components Analysis (PCA)
Barbora Spotakova (Czech Republic)

Robert Harting (Germany)

Tomasz Majewski (Poland)

Olympic gold medalists, (London 2012)
Eigenvectors

\[ C = M^T M = (USV^T)^T (USV^T) = V S^T U^T U S V^T = V (S^T S) V^T \]

[on board: elliptical geometry of \( u^T M^T M u \), with \( u \) a unit vector]
Eigenvectors

\[
C = M^T M \quad C\vec{v}_k = V (S^T S) V^T \vec{v}_k
\]

\[
= (USV^T)^T (USV^T) \quad = V (S^T S) \hat{e}_k
\]

\[
= VS^T U^T U S V^T \quad = s_k^2 V \hat{e}_k
\]

\[
= V (S^T S) V^T \quad = s_k^2 \vec{v}_k
\]

[on board: elliptical geometry of \(u^T M^T M u\), with \(u\) a unit vector]