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Quiz 5 Cheat Sheet

$$SSE(A,B) = \sum_{a_i \in A} \|a_i - \pi_B(a_i)\|^2$$

SVD: $A \in \mathbb{R}^{n \times d}$, $U \in \mathbb{R}^{n \times n}$, $S \in \mathbb{R}^{n \times d}$, $V \in \mathbb{R}^{d \times d}$

$$A = USV^T$$

PCA: k-dimensional subspace B to minimize

$$\|A - \pi_B(A)\|_F^2 = \sum_{a_i \in A} \|a_i - \pi_B(a_i)\|^2$$

Recall:

Data as a matrix:

$A \in \mathbb{R}^{n \times d}$ → SVD → map to each $f(a_i): b_i \in \mathbb{R}^d \to \mathbb{R}^k$

Projection: $\pi_B(a) = \sum_{j=1}^{k} \langle v_j, a \rangle v_j$

Power Method: Input $A \in \mathbb{R}^{n \times d}$

$M = A^T A \in \mathbb{R}^{d \times d}$ positive semi-definite

$v \leftarrow$ random vector in $\mathbb{R}^d$

$v = M^q u$ for $i = 1, \ldots, q$

$u^{(i)} = M u^{(i-1)}$

return $v_1 = \frac{v}{\|v\|_2}$