Period B Activity ECE 532

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1. a) $X = \sum_{i=1}^{n} \sigma_i u_i v_i^T$

$$X_r = \sum_{i=1}^{r} \sigma_i u_i v_i^T$$

$$E_r = X - X_r$$

$$= \sum_{r+1}^{n} \sigma_i u_i v_i^T$$

$$\text{SVD of } E_r = \sum_{r+1}^{n} \sigma_i u_i v_i^T$$

b) X is full rank, rank of $E_r = n - r$.

c) Operator norm is largest singular value

$$E_r = \sum_{r+1}^{n} \sigma_i u_i v_i^T$$

$\therefore, \|E_r\|_{op} = \sigma_{r+1}$

d) X_r will thus be a good approx. to X when $\sigma_r >> \sigma_{r+1}$