let X be a mean-centered data matrix

covariance matrix of X

$$C = \frac{1}{n} X^T X$$

By SVD we can write $X = U S V^T$

$$C = \frac{1}{n} V S U^T U S V^T$$

$$= \frac{1}{n} V S^2 V^T$$

Principal components given by columns of V

PC scores given by UD