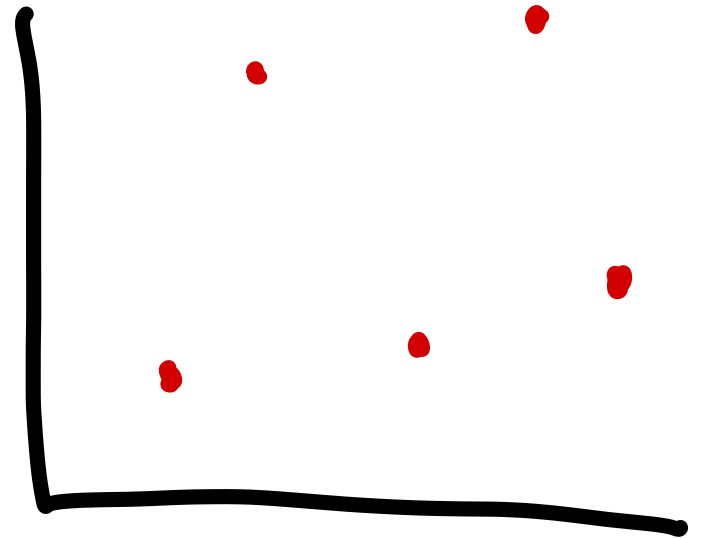
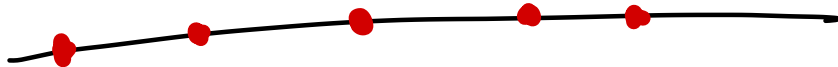
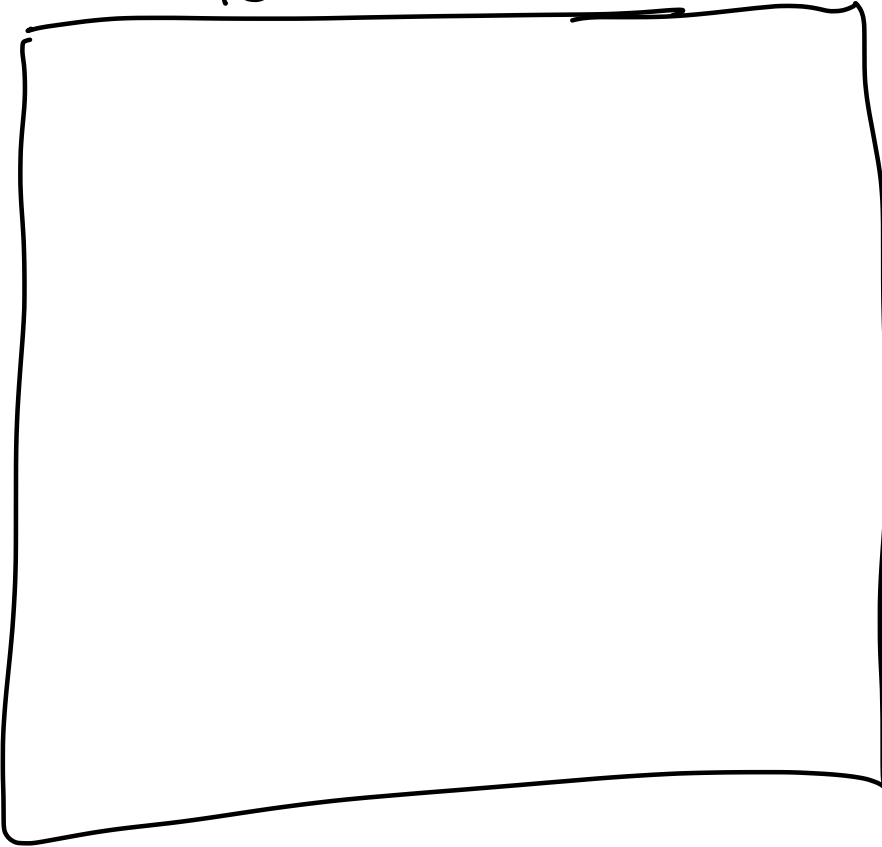


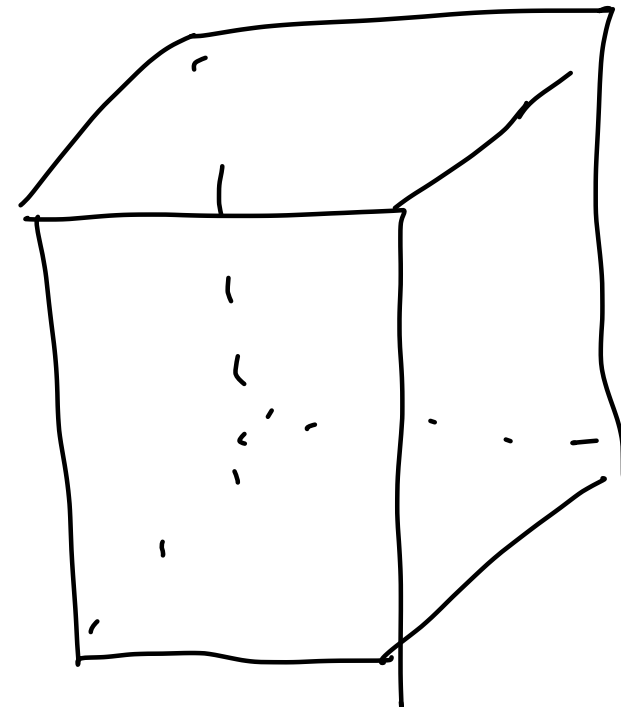
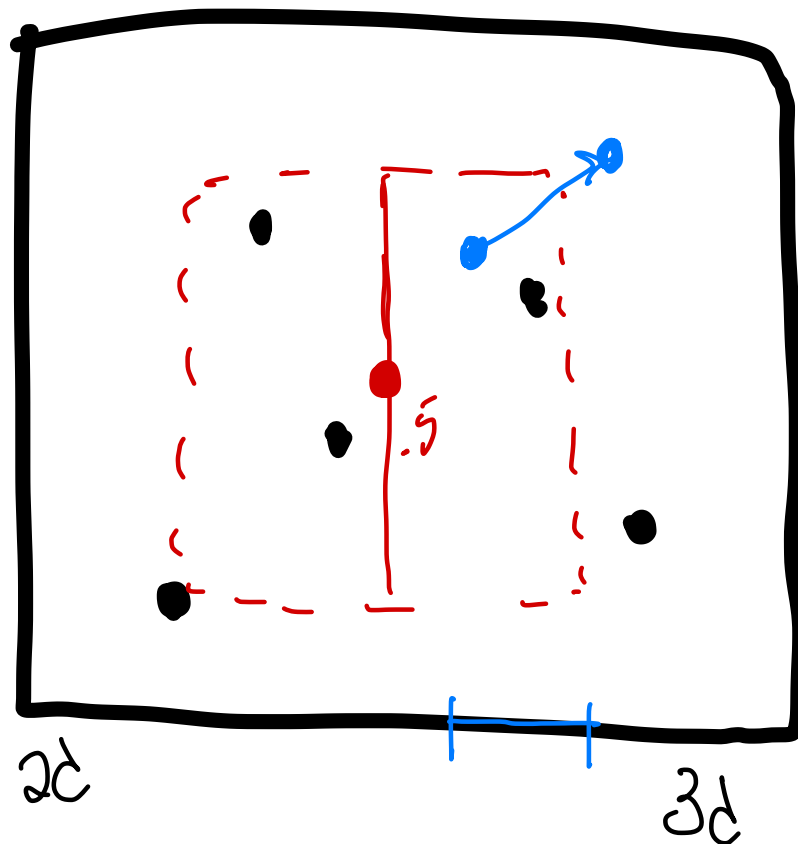
02/28/2023

Samples

features

d





b:

1

1

b:  $\frac{1}{4}$

$\frac{1}{8}$

$(\frac{1}{2})^2$

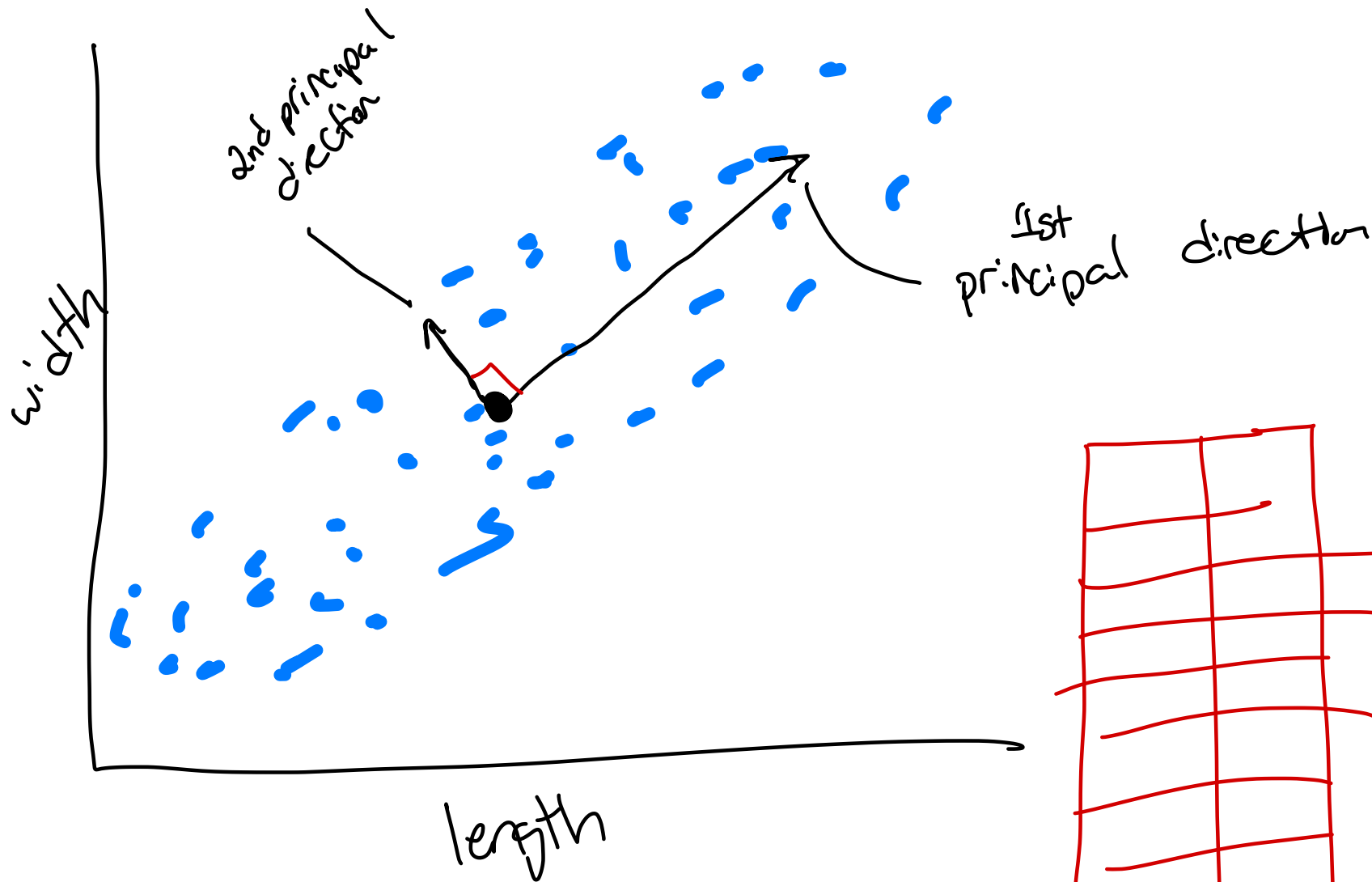
$(\frac{1}{2})^3$

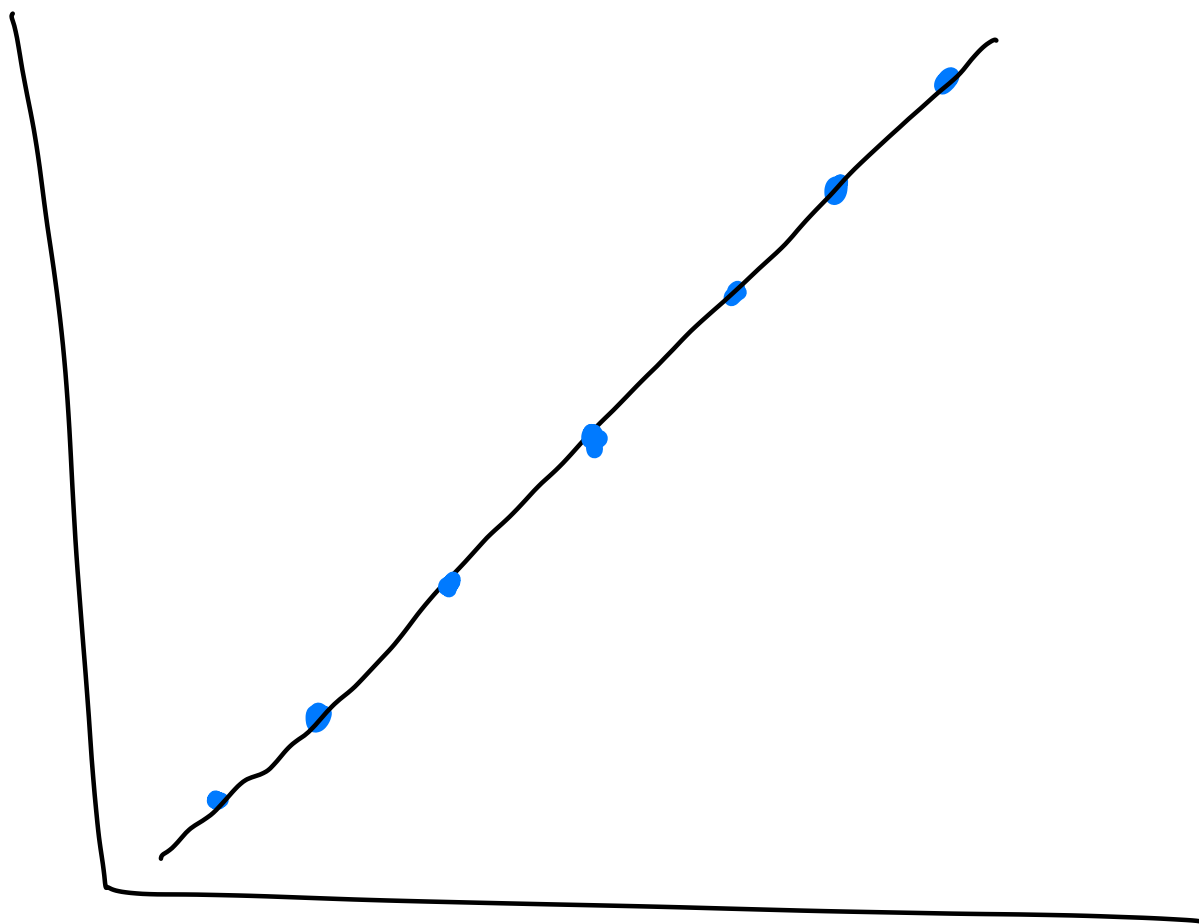
$(\frac{1}{2})^d$

Feature  
selection

Feature  
extraction

# Feature Extraction

A hand-drawn red grid on a white background. The grid consists of two vertical columns and eight horizontal rows. The lines are slightly wavy and uneven, suggesting a sketch or a rough template. The grid is oriented vertically, with the longer side being the height. The lines are drawn in a single color, red, and have a consistent thickness. The overall appearance is that of a quick, informal drawing, possibly for a sketchbook or a rough layout.A hand-drawn diagram of a vertical ladder with 8 rungs, drawn in red ink. The rungs are horizontal lines of varying lengths, connected by two vertical lines. The drawing is simple and appears to be a sketch for a diagram.



Covariance

$N$ : data points  
 $d$ : features

$\mathbf{d}$ : features

↳ measures how

very good

A hand-drawn diagram of a 2D array grid. The grid is composed of 6 columns and 6 rows of cells. To the left of the grid, the word "length" is written vertically, spanning the height of the first two rows. Below it, the word "width" is written, spanning the height of the next two rows. To the right of the grid, the word "length" is written vertically, spanning the height of the first two rows. In the top-left cell of the grid, the text "row (length, width)" is written, indicating the starting coordinates for the array.

covariance matrix

$$\boxed{X^T X \left( \frac{1}{N-1} \right)}$$

$X$ : data matrix with 0 mean

$$XV = U\Sigma$$

(only use some of columns)

$$Az = \Lambda z$$

diagonal matrix

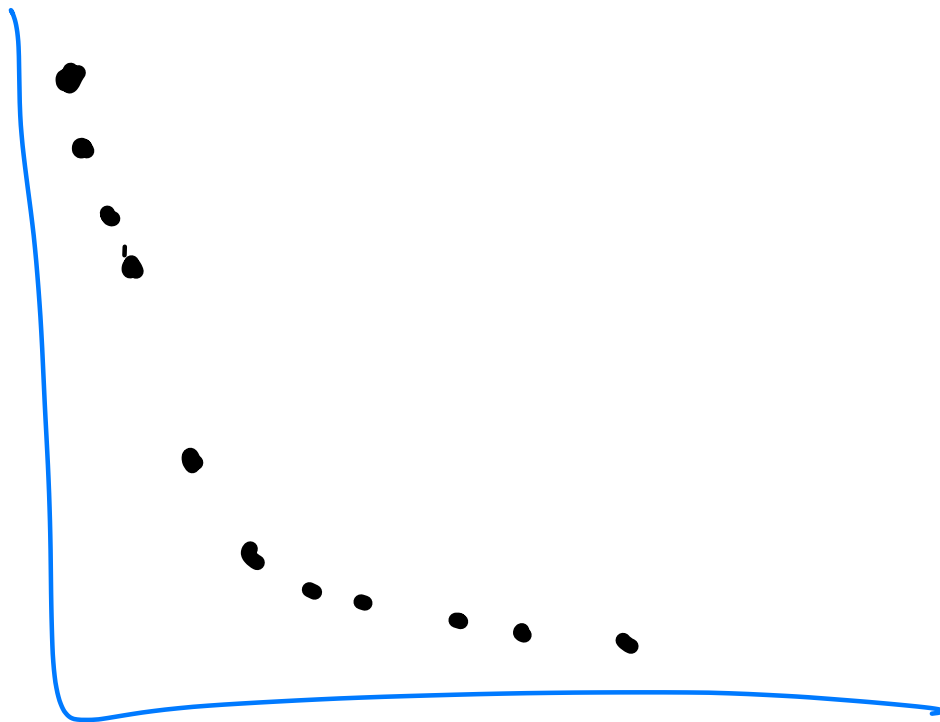
$$A = U \Sigma V^T$$

orthogonal matrix

$$X = U\Sigma V^T$$

$$\begin{aligned} X^T X &= (U\Sigma V^T)^T (U\Sigma V^T) \\ &= V\Sigma^T U^T U \Sigma V^T \\ &= V\Sigma^2 V^T \end{aligned}$$

$$(X^T X) V = V \Sigma^2$$



NMF

$$A \approx WH$$

