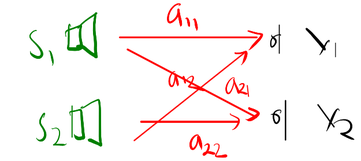
Independent Component Analysis (ICA)

Statistical — Source



Source — Sensor / (microphones) / Component

$$x_1(t) = a_{11} s_1(t) + a_{12} s_2(t)$$
$$x_2(t) = a_{21} s_1(t) + a_{22} s_2(t)$$

Mixing matrix — Sensor — Sources

$$X = A \cdot S \rightarrow X = \sum_{i=1}^{n} a_i s_i$$

$$S = A^{-1} X$$

estimated signal → y

$$y = W^T x$$

dimana $W = A^{-1}$ → salah satu

$$Z = A^T W \rightarrow Z^T = A \cdot W^T$$

$$y = W^T x = W^T A s = Z^T \cdot s$$

↳ become less gaussian when equal to s_i

W → maximize non gaussianity of $W^T x$

Independent

Central Limit Theorem:

"Sum of independent variables tends toward a Gaussian distribution"

y_1 → Independence y_2

jika

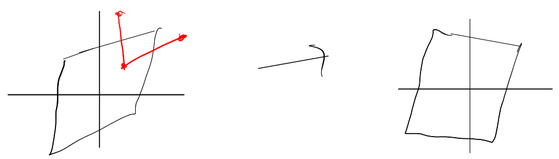
$$p(y_1, y_2) = p_1(y_1)\, p_2(y_2)$$

joint pdf — pdf — pdf

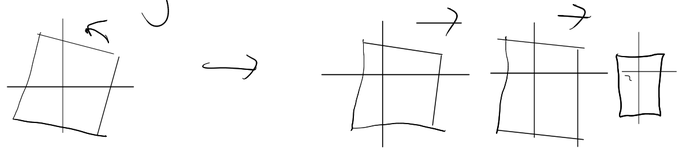
Preprocessing

① Centering : $X = X - X.\text{mean}()$

② Whitening



③ Rotating



rotate until Convergence!

Convergence → w & w^+ in the same direction

∴ $w \times w^+ \approx 1$