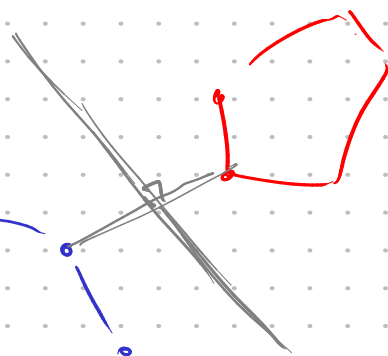
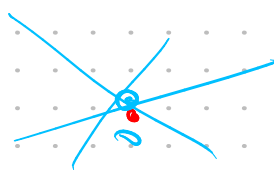


$$\bar{x} \mapsto \begin{pmatrix} 1 \\ \bar{x} \end{pmatrix}$$



EM:

$X$  - observed  
 $Z$  - latent vars

$$D = \left\{ (\bar{x}_n, \bar{z}_n) \right\}_{n=1}^N$$

$$p(x|\theta) \xrightarrow{\theta} \max$$

$$\bar{u}_n = (\bar{x}_n, \bar{z}_n)$$

$$f(z_1, z_2) = L$$

observable

$$D = \left\{ (\bar{u}_n) \right\}_{n=1}^N$$

$$p(u|\theta) = \prod p(u_n|\theta) \quad p(x|\theta) \xrightarrow{\theta} \max$$

$$p(\bar{x}_n | \bar{u}_n, \theta) = \underline{p(\bar{x}_n | \bar{u}_n)}$$

$$\bar{x}_n = f(\bar{u}_n)$$

parameter

$$\frac{\partial L}{\partial w} \cdot \Delta \text{NDCG}$$

$$\boxed{\text{NDCG}} \rightarrow \max$$

$$L$$

$$\frac{\partial L}{\partial w}$$

