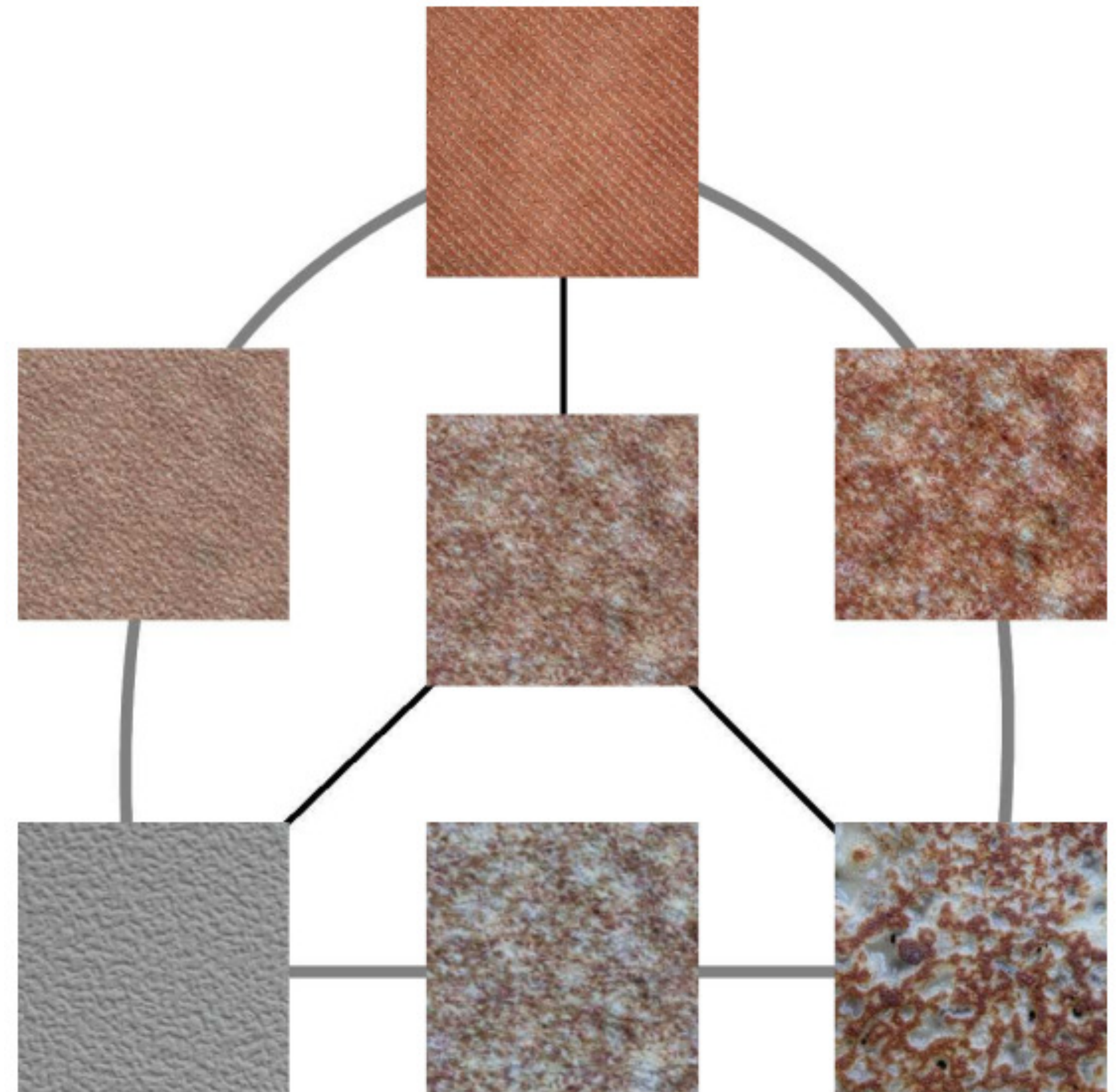


Wasserstein Barycenter and its Application to Texture Mixing

Rabin Julien, Gabriel Peyré, Julie Delon, Bernot Marc

Transport Optimal

pour le mélange de texture



99%

Transport optimal

1% Texture

Les barycentres ?

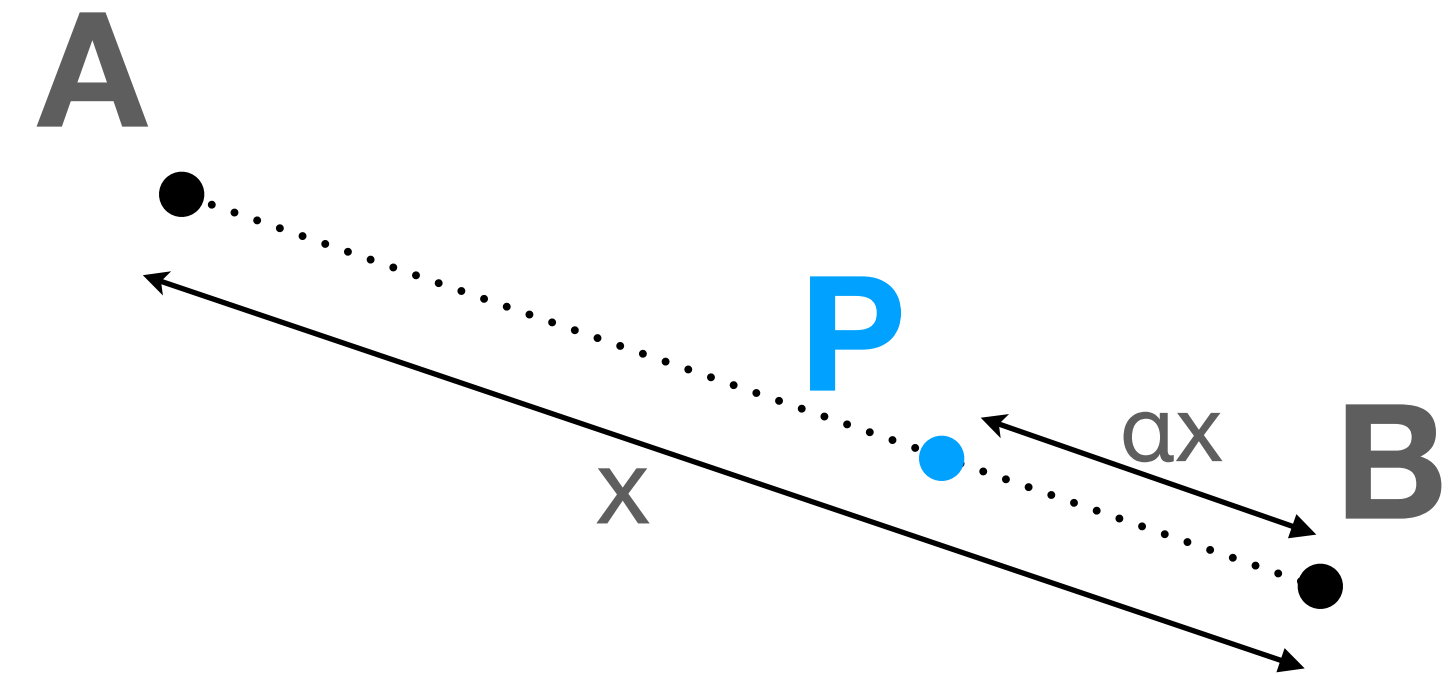
C'est au milieu

- Vision classique du barycentre:

$$\alpha A + (1 - \alpha)B$$

- Solution au problème de minimisation:

$$\min_P (\alpha \|AP\| + (1 - \alpha) \|BP\|)$$



Les barycentres ?

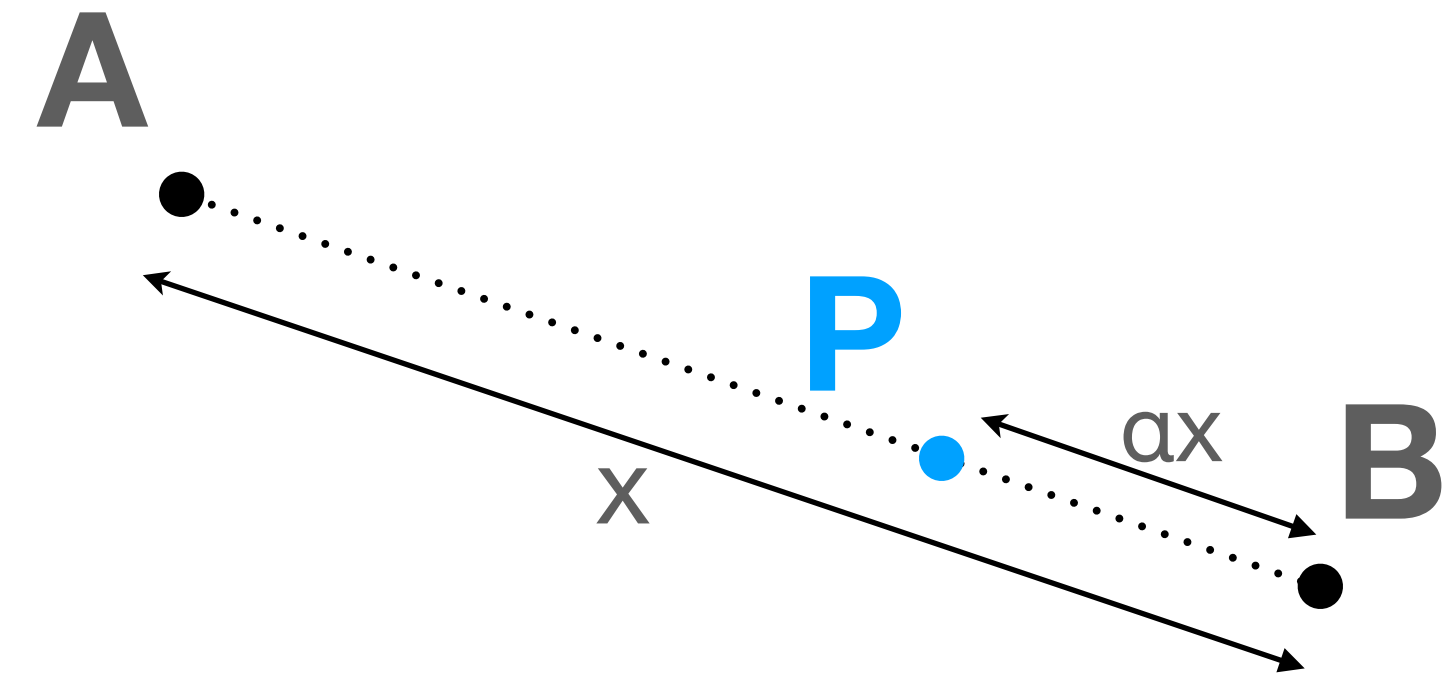
C'est au milieu

- Vision classique du barycentre:

$$\alpha A + (1 - \alpha)B$$

- Solution au problème de minimisation:

$$\min_P (\alpha d(A, P) + (1 - \alpha)d(B, P))$$



Les barycentres ?

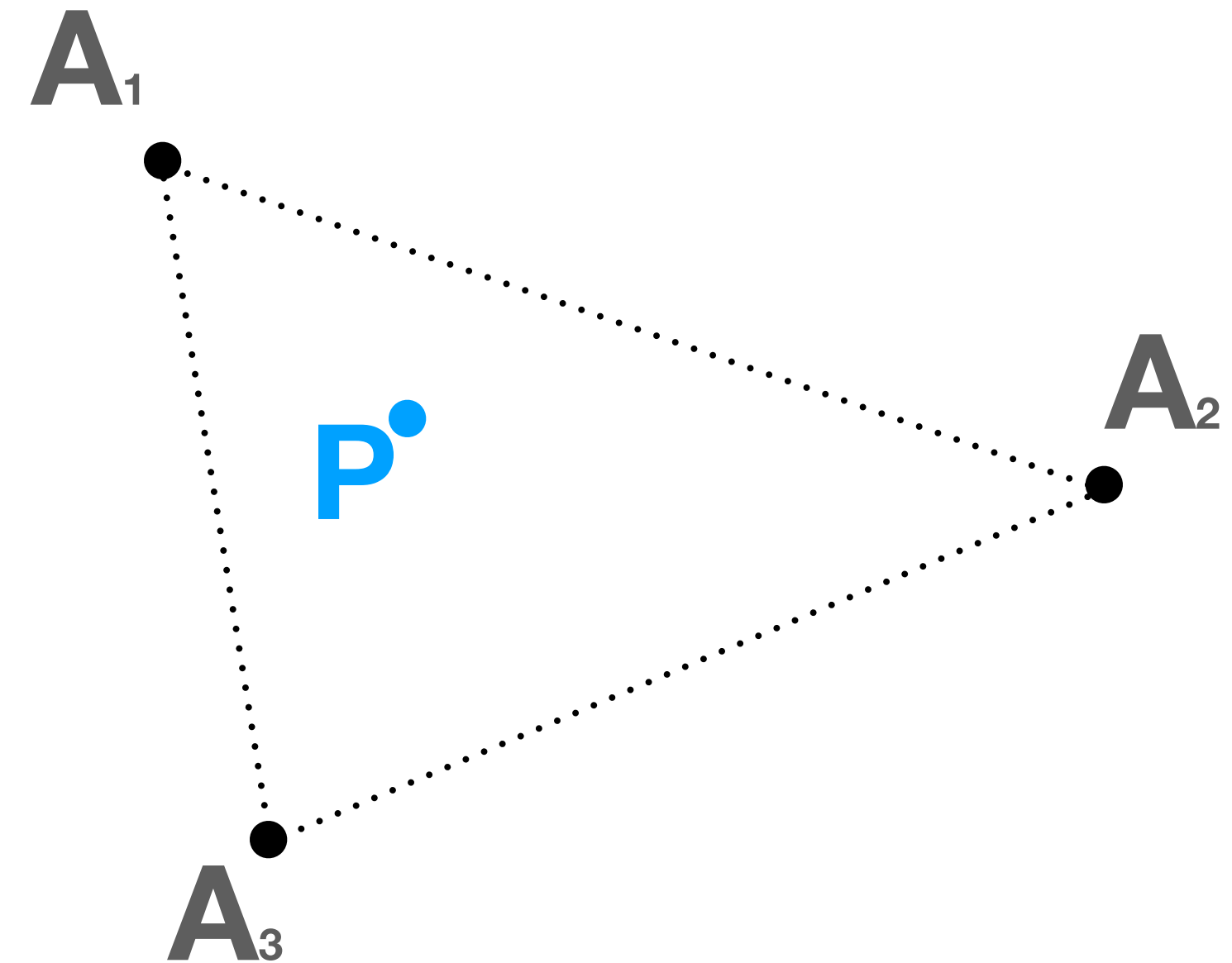
C'est au milieu

- Vision classique du barycentre:

$$\alpha A + (1 - \alpha)B$$

- Solution au problème de minimisation:

$$\min_P \left(\sum \alpha_i d(P, A_i) \right)$$



Le transport Optimal continu

- Transporter des tas de sable
- Somme du cout de transport de chaque grain

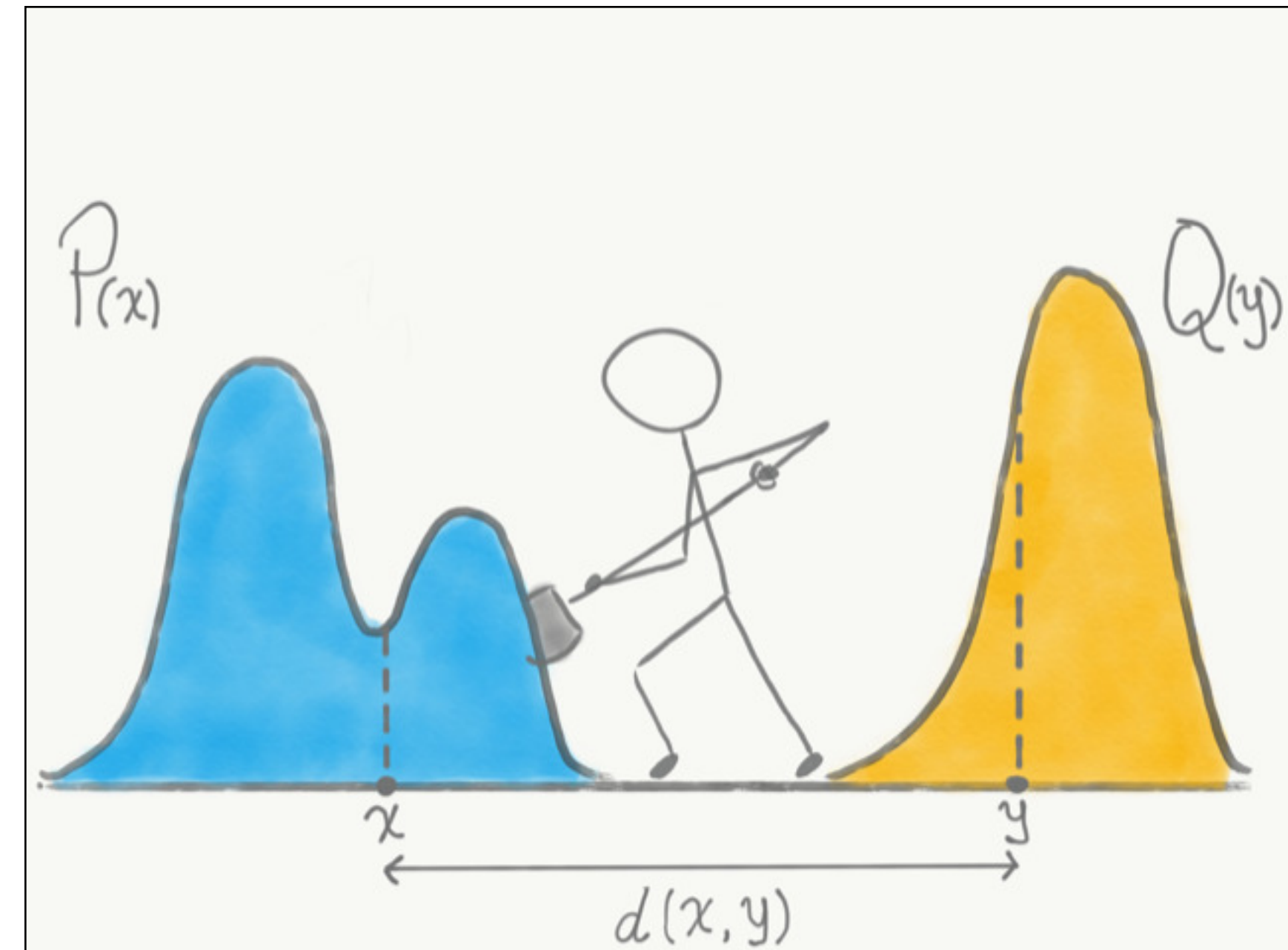


Illustration du transport optimal - David Alvarez-Melis (Microsoft research)

Le transport Optimal continu

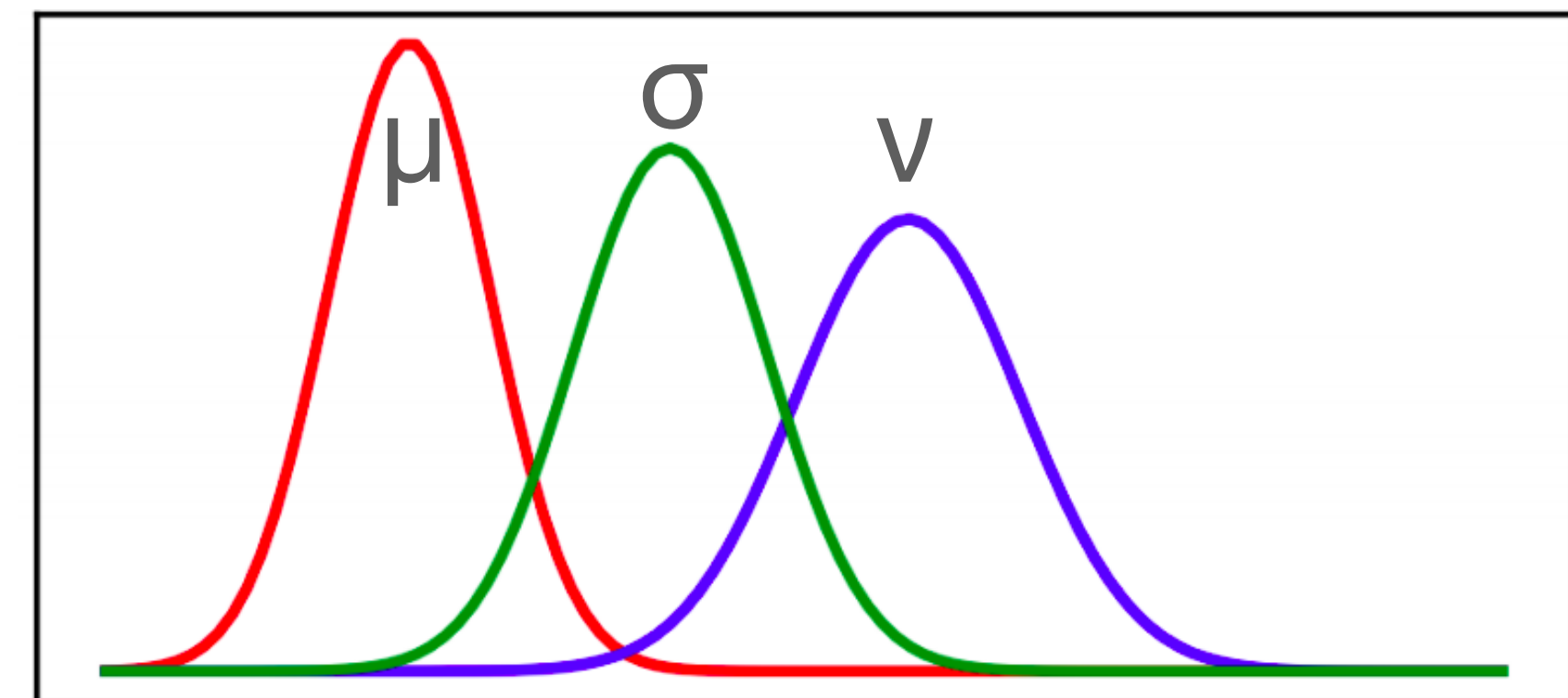
- Transporter des tas de sable
- Somme du cout de transport de chaque grain



Illustration du transport optimal - David Alvarez-Melis (Microsoft research)

- Barycentre de Wasserstein

$$\sigma = \operatorname{argmin}_{\sigma} \frac{1}{2} W(\sigma, \mu) + \frac{1}{2} W(\sigma, \nu)$$



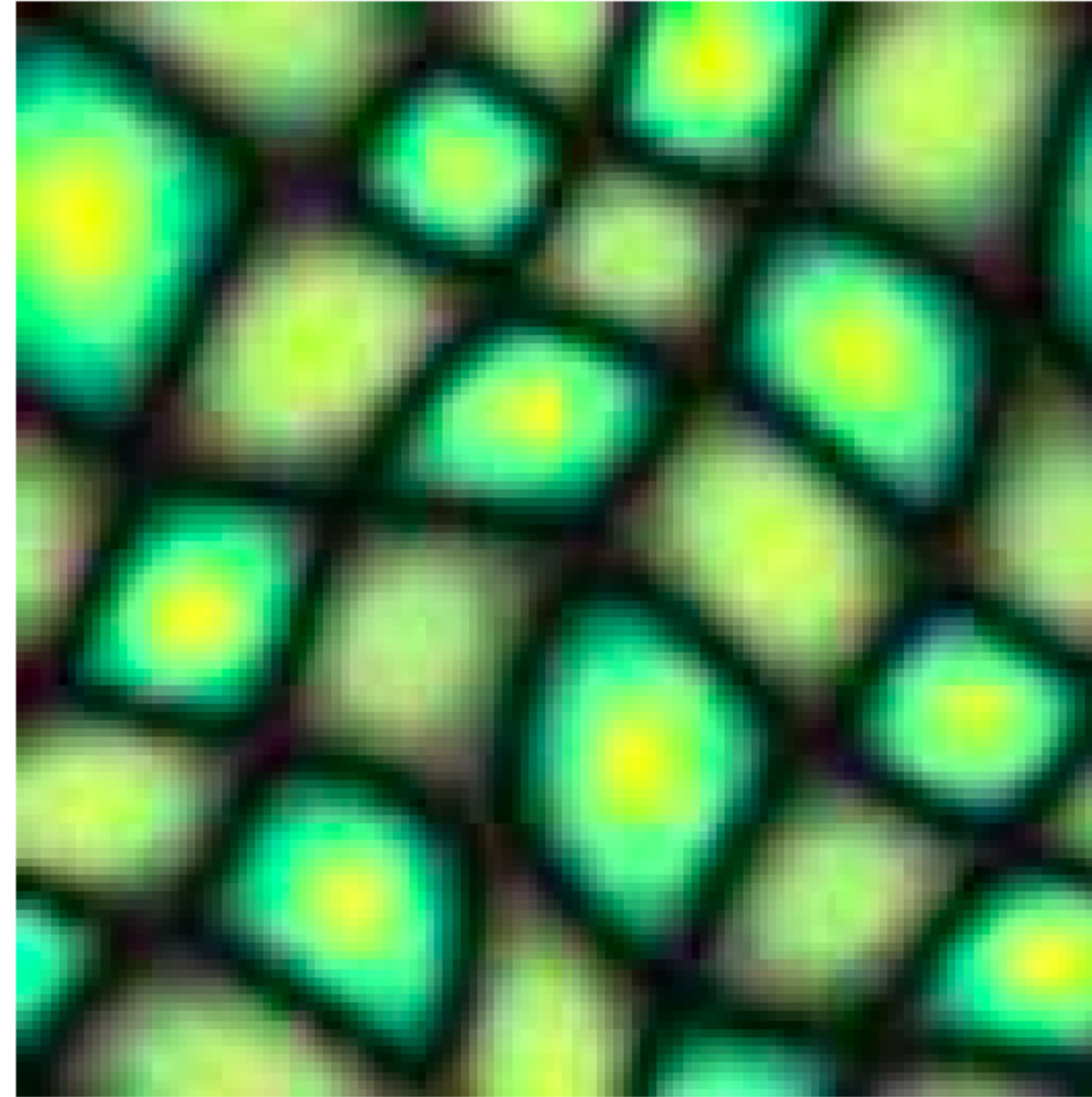
Wasserstein barycenter - Remi Flamary

Aspect Texture

- Texture en niveau de gris = fonction 2D
- Texture en couleur ?

Aspect Texture

- Texture en niveau de gris = fonction 2D
- Texture en couleur: Transformation en nuage de points



Wavelet transform, ...

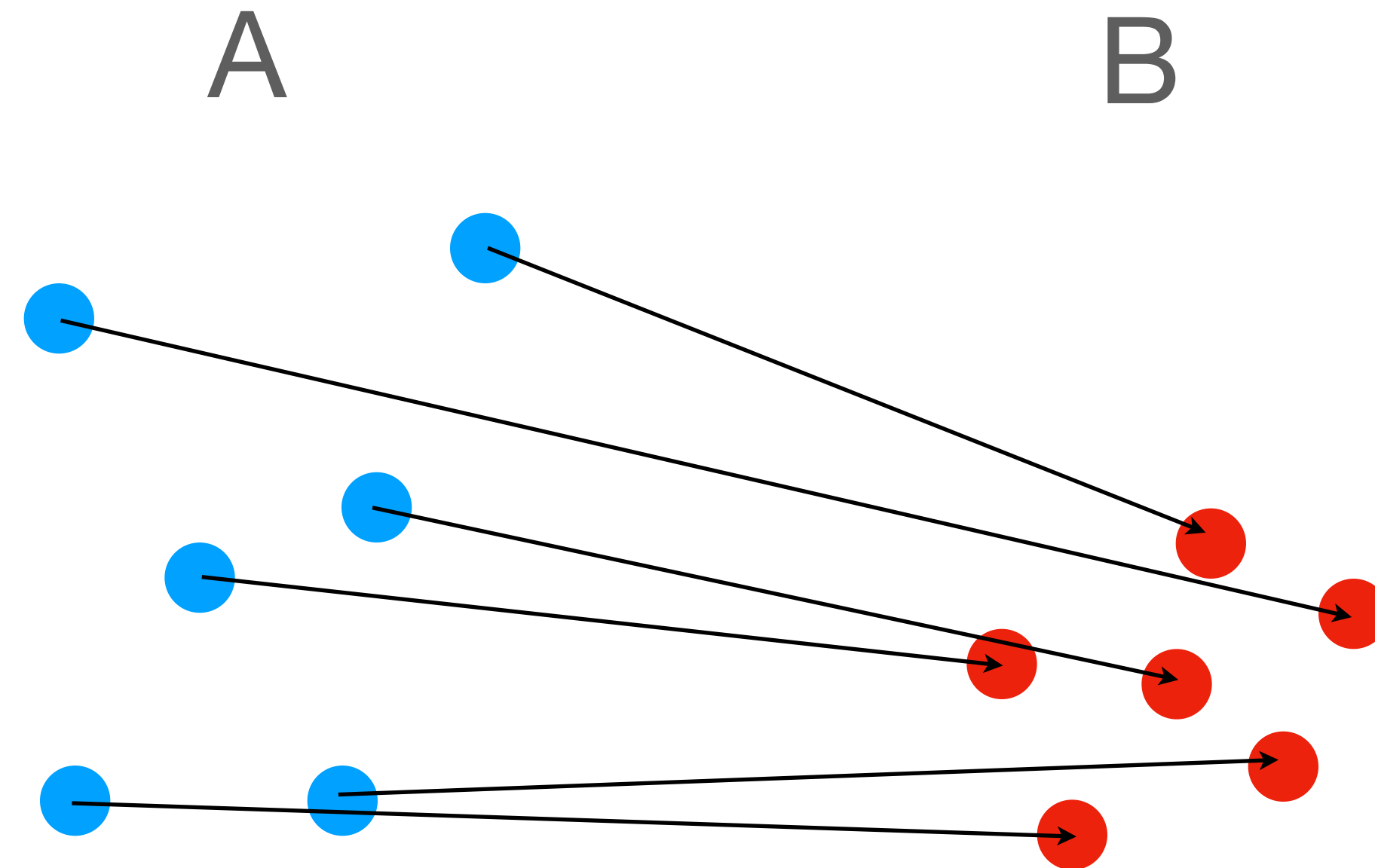




Le transport Optimal discret

- Affectation entre chaque points

$$W(A, B) = \sum_i \|A_i - B_{\sigma_i}\|^2$$

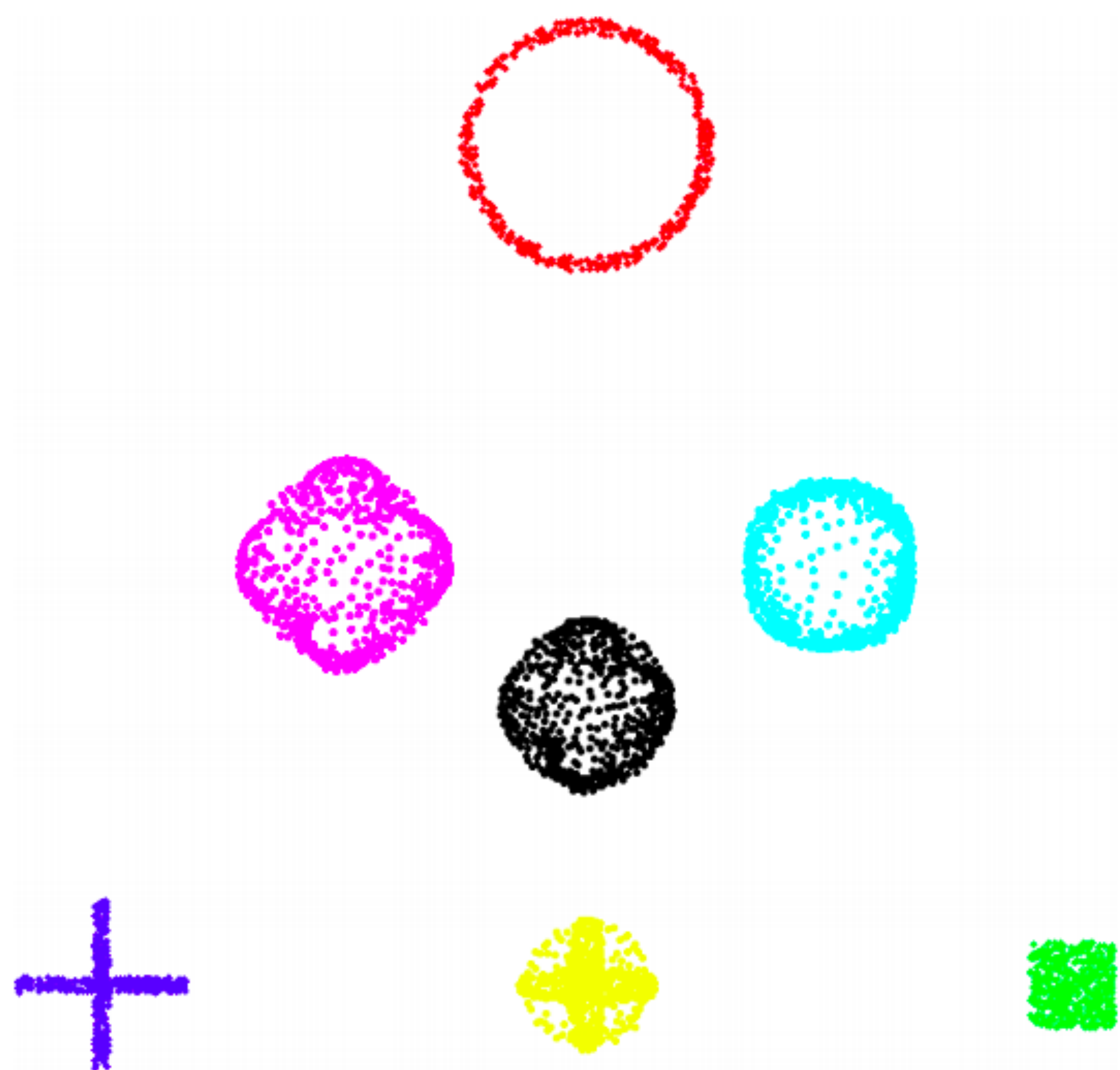


Le transport Optimal discret

- Barycentre:

$$\min_P \left(\sum \alpha_i d(P, A_i) \right)$$

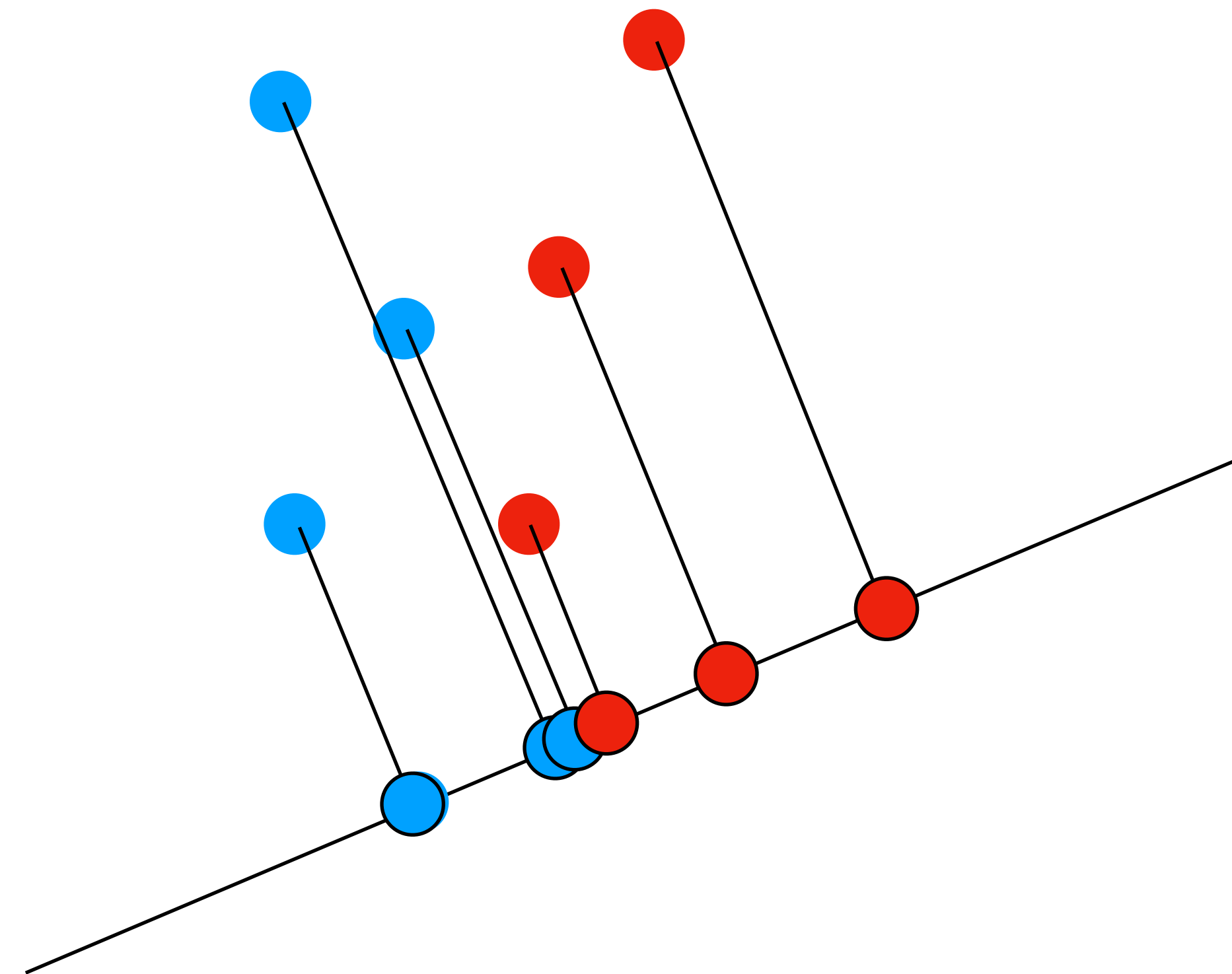
- Dur de minimiser le transport en plus haute dimensions



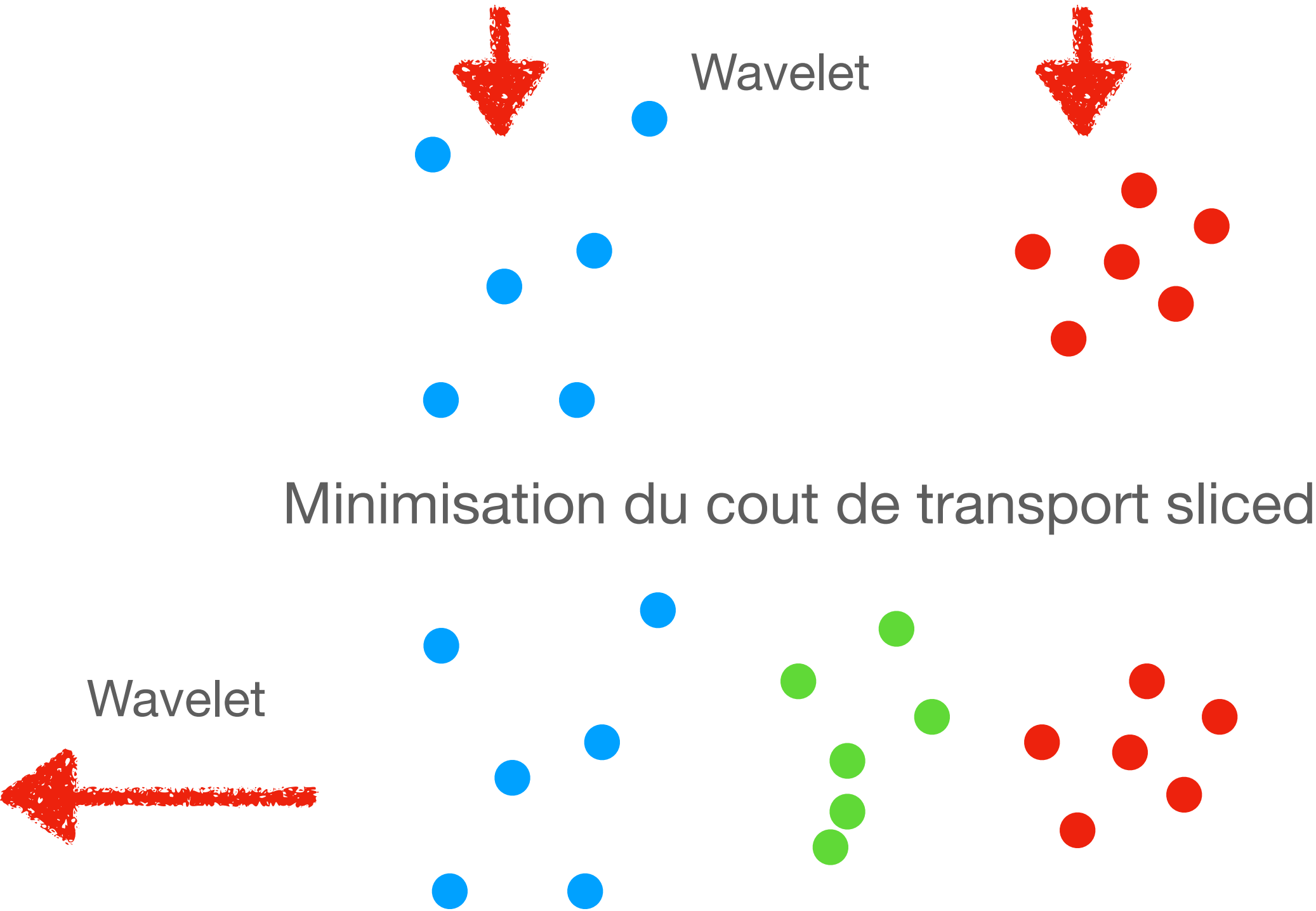
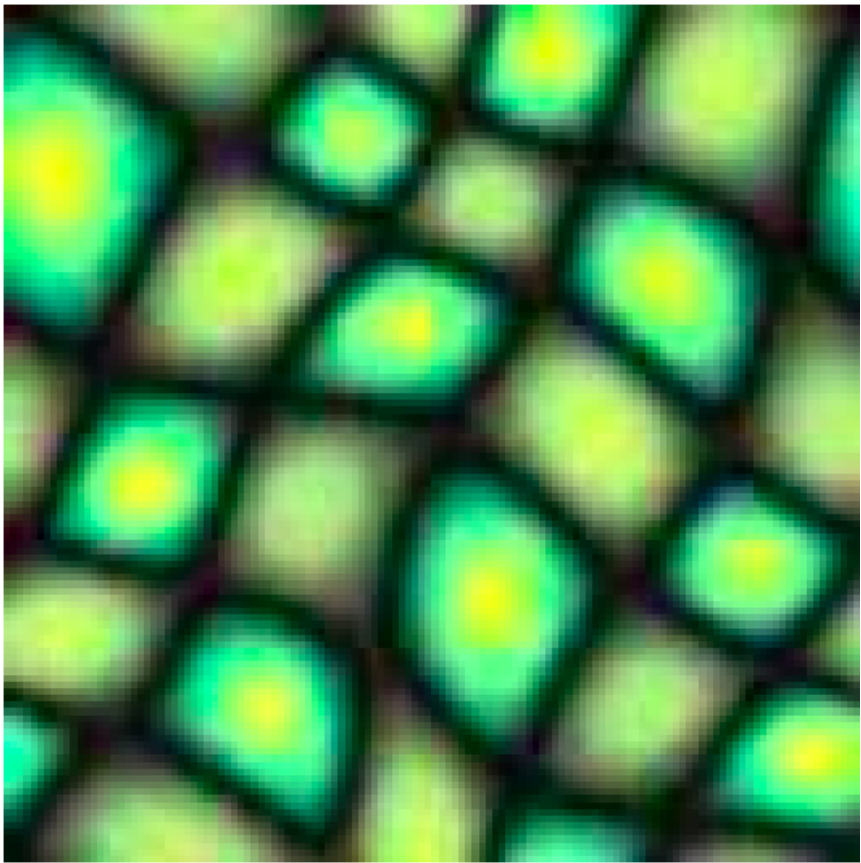
Le transport Sliced

discret

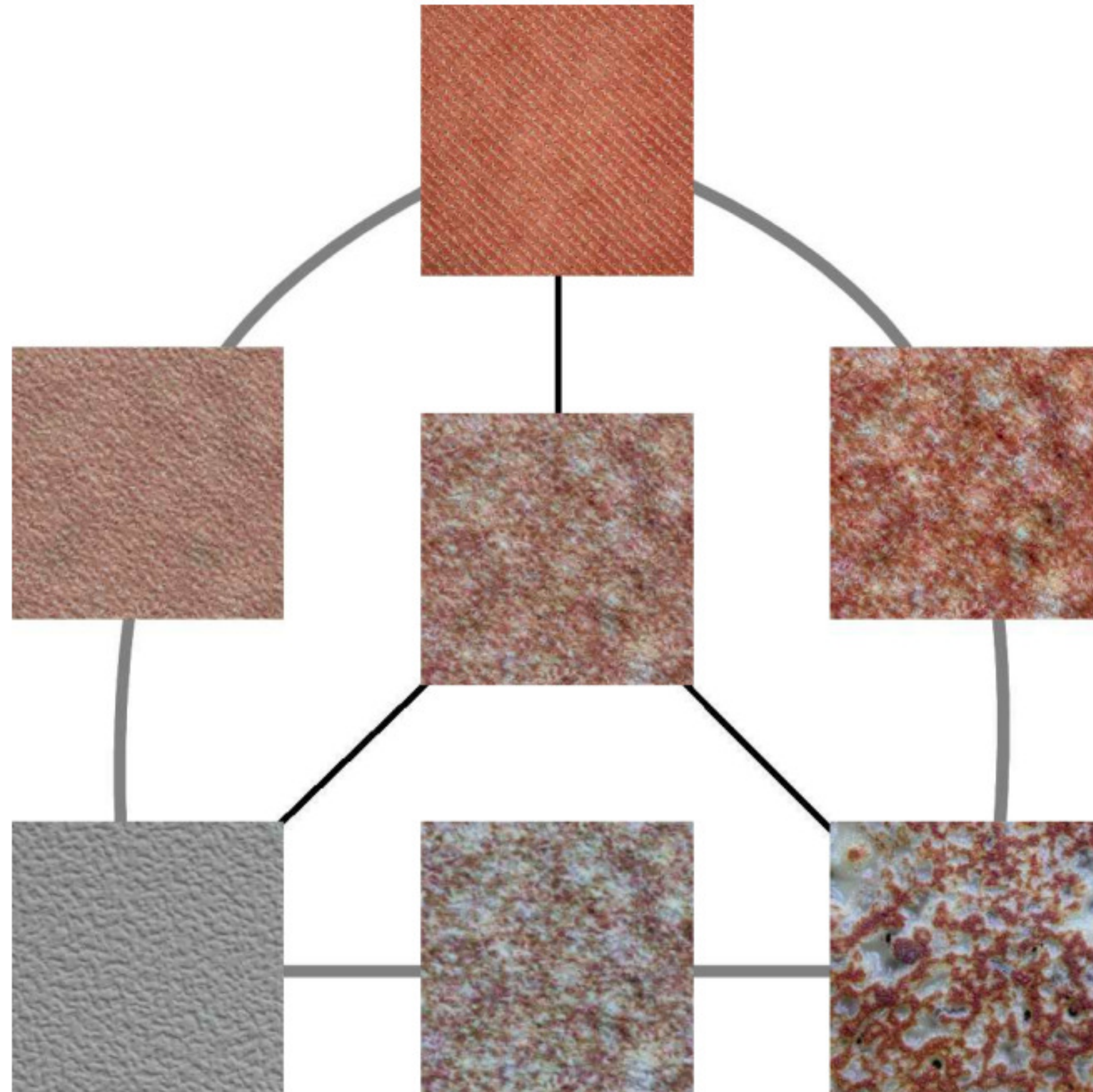
- Dur de minimiser le transport en plus haute dimensions
- Formulation projective du transport
- Affectation triviale en 1D
- Minimisation pour calcul du barycentre possible



Pipeline complet



Resultats



Conclusion

- Apport de la formulation sliced du transport
- Descente de gradient stochastique pour barycentre de nuage de points
- Mélange de texture

