Gradient descent :

$$T_{k+1} \leftarrow \arg \min_{T:(Q_{k+1},R_{k+1},T)\in\mathcal{C}_2} \langle T, \nabla_T \mathcal{L}_{\text{LC}} \rangle + \frac{1}{\gamma_k} \|T - T_k\|_2.$$

Mirror descent (to take into account that T has positive entries) :

$$T_{k+1} \leftarrow \arg \min_{T:(Q_{k+1},R_{k+1},T)\in\mathcal{C}_2} \langle T, \nabla_T \mathcal{L}_{\text{LC}} \rangle + \frac{1}{\gamma_k} \text{KL}(T \parallel T_k).$$

T and T_k have positive entries with sum equal to 1.

$$\text{KL}(T \parallel T_k) = \sum_{i,j} (t_{i,j}^{(k)} log(\frac{t_{i,j}^{(k)}}{t_{i,j}})) = -\mathcal{E}(T) + cte.$$

Thus,

$$T_{k+1} \leftarrow \arg \min_{T:(Q_{k+1},R_{k+1},T)\in\mathcal{C}_2} \langle T, \nabla_T \mathcal{L}_{\text{LC}} \rangle - \frac{1}{\gamma_k} \mathcal{E}(T).$$

$$(Q_{k+1}, R_{k+1}, T) \in \mathcal{C}_2 \Leftrightarrow T \in \Pi_{g_{Q_{k+1}}, g_{R_{k+1}}}$$

Balanced optimal transport problem with Sinkhorn solution.