Partial Matching in the space of Varifolds

Pierre-Louis Antonsanti, Irène Kaltenmark, Joan Glaunès.

$$\arg\min_v J(v) = \underbrace{\gamma . E(v)}_{\text{Deformation cost}} + \underbrace{A(\varphi^v(S), T)}_{\text{Data attachment}}$$

$v \in L^2([0,1], V)$
φ^v a C^1- diffeomorphism, solution at t=1 of the flow equation

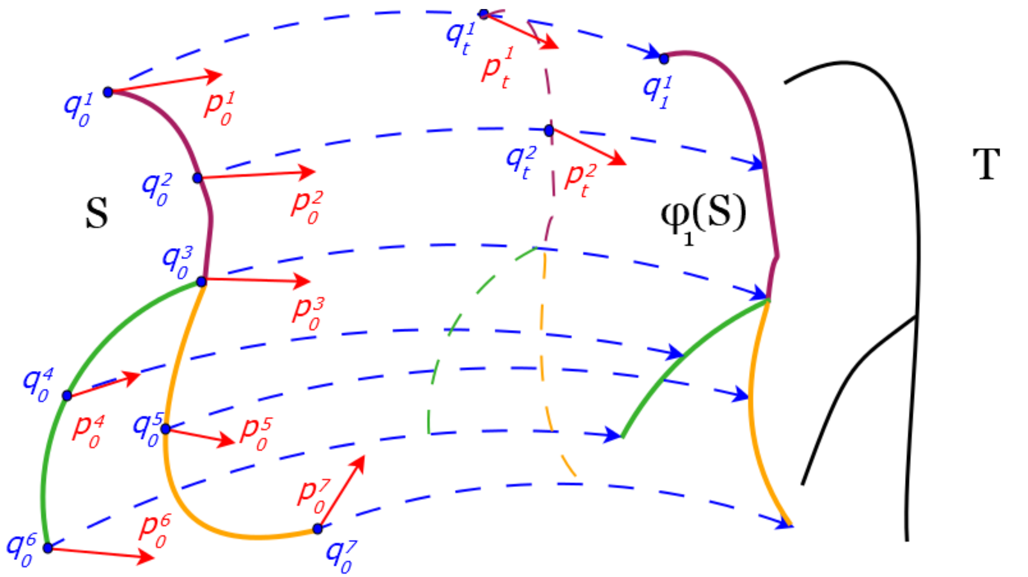
Varifold distance :

$$A(\varphi^v(S), T) = \left\|\mu_{\varphi^v(S)}\right\|_{W'}^2 - 2.\langle \mu_{\varphi^v(S)} | \mu_T \rangle + \|\mu_T\|_{W'}^2$$

Partial matching dissimilarity function (first idea) :

$$A(\varphi^v(S), T) = \left(\left\|\mu_{\varphi^v(S)}\right\|_{W'}^2 - \langle \mu_{\varphi^v(S)} | \mu_T \rangle\right)^2$$

$$= \langle \mu_{\varphi^v(S)} | \mu_{\varphi^v(S)} - \mu_T \rangle^2$$



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GE Healthcare

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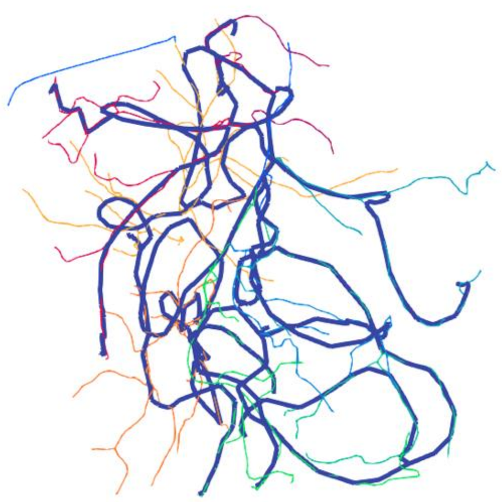
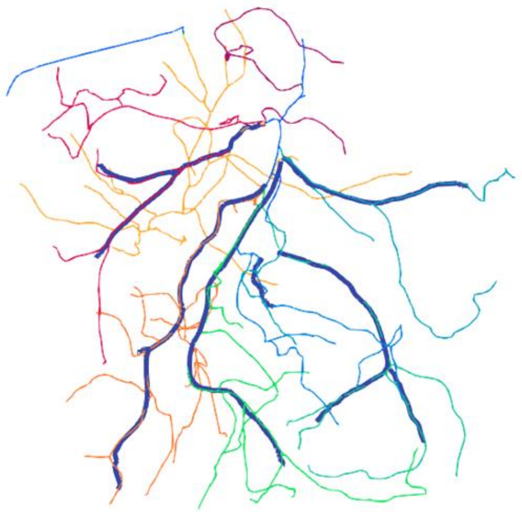
The partial dissimilarity : $\boldsymbol{\Delta(S,T) = \int_S g\left(\omega_S(x,\tau_x S) - \widetilde{\omega_T}(x,\tau_x S)\right) dx}$,

with $g(x) = \max(0,x)^2$ and $\widetilde{\omega_T}(x,\tau_x S) = \int_T \min\left(1, \frac{\omega_S(x,\tau_x S)}{\omega_T(y,\tau_y T)}\right) k_e(y,x).\, k_t(\tau_y T, \tau_x S) dy$.



Varifold registration



Partial dissimilarity registration