# skfda.preprocessing.registration.warping_mean

**skfda.preprocessing.registration.warping_mean**(*warping, *, iter=20, tol=1e-05, step_size=1.0, eval_points=None, return_shooting=False*) [source]

Compute the karcher mean of a set of warpings.

Let $\gamma_i i = 1 ... n$ be a set of warping functions $\gamma_i : [a, b] \to [a, b]$ in $\Gamma$, i.e., monotone increasing and with the restriction $\gamma_i(a) = a\, \gamma_i(b) = b$.

The karcher mean $\bar{\gamma}$ is defined as the warping that minimises locally the sum of Fisher-Rao squared distances. [SK16-8-3-2].

$$\bar{\gamma} = argmin_{\gamma \in \Gamma} \sum_{i=1}^{n} d_{FR}^2(\gamma, \gamma_i)$$

The computation is performed using the structure of Hilbert Sphere obtained after a transformation of the warpings, see [S11-3-3].

**Parameters:**

- **warping** ( `FDataGrid` ) – Set of warpings.
- **iter** (*int*) – Maximun number of interations. Defaults to 20.
- **tol** (*float*) – Convergence criterion, if the norm of the mean of the shooting vectors, $|\bar{v}| < tol$, the algorithm will stop. Defaults to 1e-5.
- **step_size** (*float*) – Step size $\epsilon$ used to update the mean. Default to 1.
- **eval_points** (*array_like*) – Discretisation points of the warpings.
- **shooting** (*boolean*) – If true it is returned a tuple with the mean and the shooting vectors, otherwise only the mean is returned.

**Returns:** ( `FDataGrid` ) Fdatagrid with the mean of the warpings. If shooting is True the shooting vectors will be returned in a tuple with the mean.

### References

[SK16-8-3-2] Srivastava, Anuj & Klassen, Eric P. (2016). Functional and shape data analysis. In *Template: Center of the Mean Orbit* (pp. 274-277). Springer.

[S11-3-3] Srivastava, Anuj et. al. Registration of Functional Data Using Fisher-Rao Metric (2011). In *Center of an Orbit* (pp. 9-10). arXiv:1103.3817v2.