skfda.preprocessing.registration.elastic_mean

skfda.preprocessing.registration.elastic_mean(*fdatagrid, *, lam=0.0, center=True, iter=20, tol=0.001, initial=None, eval_points=None, fdatagrid_srsf=None, grid_dim=7, **kwargs*)
[source]

Compute the karcher mean under the elastic metric.

Calculates the karcher mean of a set of functional samples in the amplitude space $\mathcal{A} = \mathcal{F}/\Gamma$.

Let q_i the corresponding SRSF of the observation f_i. The space $\mathcal{A}$ is defined using the equivalence classes $[q_i] = \{q_i \circ \gamma \| \gamma \in \Gamma\}$, where Γ denotes the space of warping functions. The karcher mean in this space is defined as

$$[\mu_q] = argmin_{[q] \in \mathcal{A}} \sum_{i=1}^{n} d_\lambda^2([q], [q_i])$$

Once $[\mu_q]$ is obtained it is selected the element of the equivalence class which makes the mean of the warpings employed be the identity.

See [SK16-8-3-1] and [S11-3].

Parameters:	• **fdatagrid** (`FDataGrid`) – Set of functions to compute the mean.
	• **lam** (*float*) – Penalisation term. Defaults to 0.
	• **center** (*boolean*) – If true it is computed the mean of the warpings and used to select a central mean. Defaults True.
	• **iter** (*int*) – Maximun number of iterations. Defaults to 20.
	• **tol** (*float*) – Convergence criterion, the algorithm will stop if :math: ´|mu^{(nu)} - mu^{(nu - 1)} |_2 /	mu^{(nu-1)} |_2 < tol´.
	• **initial** (*float*) – Value of the mean at the starting point. By default takes the average of the initial points of the samples.
	• **eval_points** (*array_like*) – Points of discretization of the fdatagrid.
	• **fdatagrid_srsf** (`FDataGrid`) – SRSF if the fdatagrid, if it is passed it is not computed in the algorithm.
	• **grid_dim** (*int*, *optional*) – Dimension of the grid used in the alignment algorithm. Defaults 7.
	• **kwargs** (**) – Named options to be pased to `warping_mean()` .
Returns:	FDatagrid with the mean of the functions.

Return type: (`FDataGrid`)

Raises: `ValueError` – If the object is multidimensional or the shape of the srsf do not match with the fdatagrid.

References

[SK16-8-3-1]   Srivastava, Anuj & Klassen, Eric P. (2016). Functional and shape data analysis. In *Karcher Mean of Amplitudes* (pp. 273-274). Springer.

[S11-3]   Srivastava, Anuj et. al. Registration of Functional Data Using Fisher-Rao Metric (2011). In *Karcher Mean and Function Alignment* (pp. 7-10). arXiv:1103.3817v2.