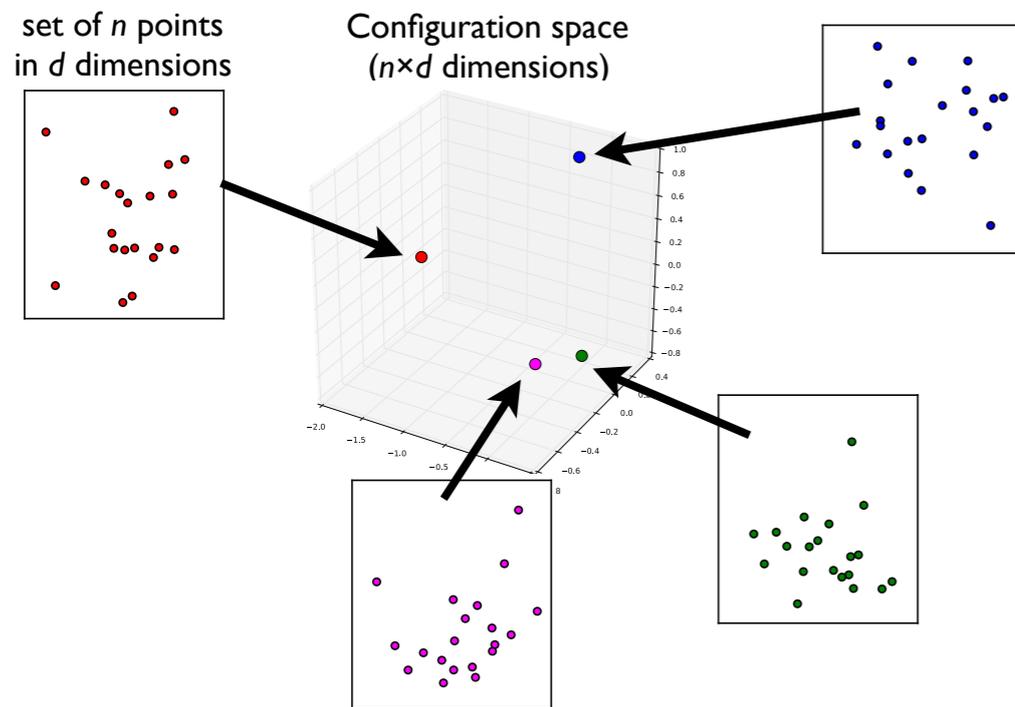


# A State-Space Model on Interactive Dimensionality Reduction

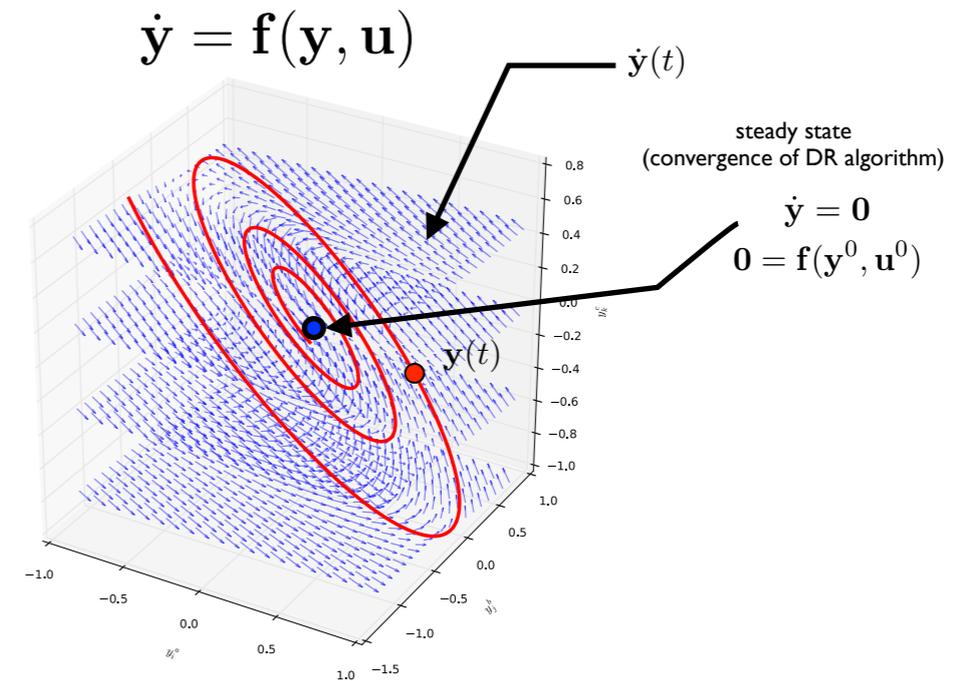
Ignacio Díaz<sup>1</sup>, Abel A. Cuadrado<sup>1</sup> and Michel Verleysen<sup>2</sup> \*

1- Electrical Engineering Dept. University of Oviedo  
 Edif. Dept. 2, campus de Viesques s/n 33204, Gijón, SPAIN  
 2- Univ. Catholique de Louvain - Machine Learning Group  
 ICTEAM/ELEN - Place du Levant, 3 1348 Louvain-la-Neuve, Belgium

**Idea: consider the *configuration space* of pointsets**



**Pose DR in terms of state-space dynamics in the configuration space**



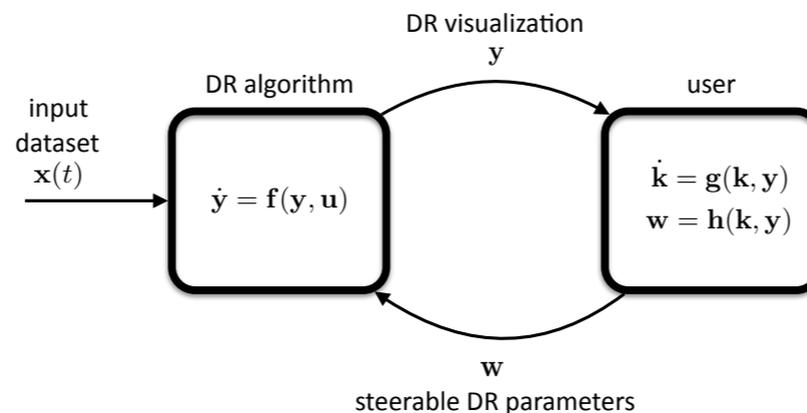
## Theoretical framework

### Description of DR dynamics

### Three examples of iDR

- DR tracking of time-varying input data
- introducing class knowledge
- interactive steering of DR parameters

### Conceptual model for user interaction in iDR



## Further work

### Eigenmode analysis of DR dynamics

Local (linear) model around  $\{y_o, w_o, x_o\}$ :

$$\dot{y} = \mathbf{A}y + \mathbf{B}u$$

local stability and dynamics  $\rightarrow$  eigenmode analysis of

$$\mathbf{A} = \left. \frac{\partial f(\mathbf{y}, \mathbf{u})}{\partial \mathbf{y}} \right|_o$$